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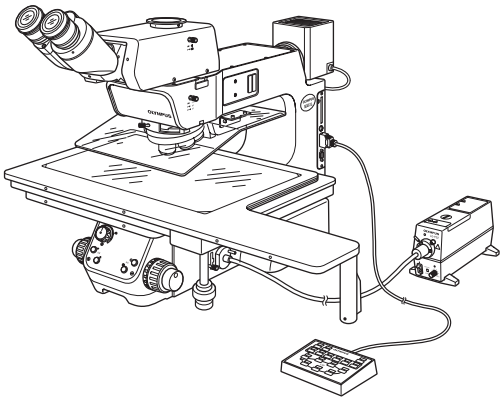

ASSEMBLY/SETUP MANUAL

MX61/MX61L

200mm/300mm COMPATIBLE SEMICONDUCTOR/FPD INSPECTION MICROSCOPES

This manual is for assembly and setup of the Olympus MX61/MX61L Semiconductor/FPD Inspection Microscopes. To ensure the safety, obtain optimum performance and familiarize yourself fully with the use of this microscope, we recommend that you study this manual thoroughly before operating the microscope. As this manual will be needed when you replace the lamp or fuses or modify a setup, retain it in an easily accessible place near the work desk for future reference.

AX7599

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IMPORTANT

These microscopes employ a UIS2 (UIS) (Universal Infinity System) optical design, and should be used only with UIS2 (UIS) eyepieces, objectives, observation tubes, etc. Less-than-optimal performance may result if inappropriate accessories are used.
The MX61L microscope is compatible with a stage stroke of 300 mm (12 inches) and the MX61 microscope is compatible with that of 200 mm (8 inches).

⚠ SAFETY PRECAUTIONS

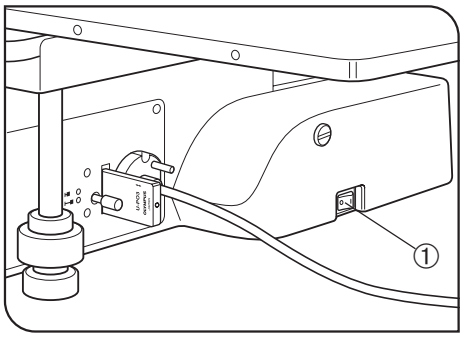


Fig. 1

1. Always use the power cord provided by Olympus. If no power cord is provided, please select the power cord by referring to the section "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual. If the proper power cord is not used, Olympus can no longer warrant the electrical safety performance of the equipment. Lay out the power cord at a sufficient distance from the sources of heat such as the power supply unit/light source and lamp housing to avoid contact with these heat sources.
2. To avoid potential shock hazard, always set the main switch ① to O (OFF) and disconnect the power cord before replacing the burner or connecting/disconnecting motorized parts. And since the system contains motorized parts, do not plug in the power cord until all of the assembly procedures have completed.

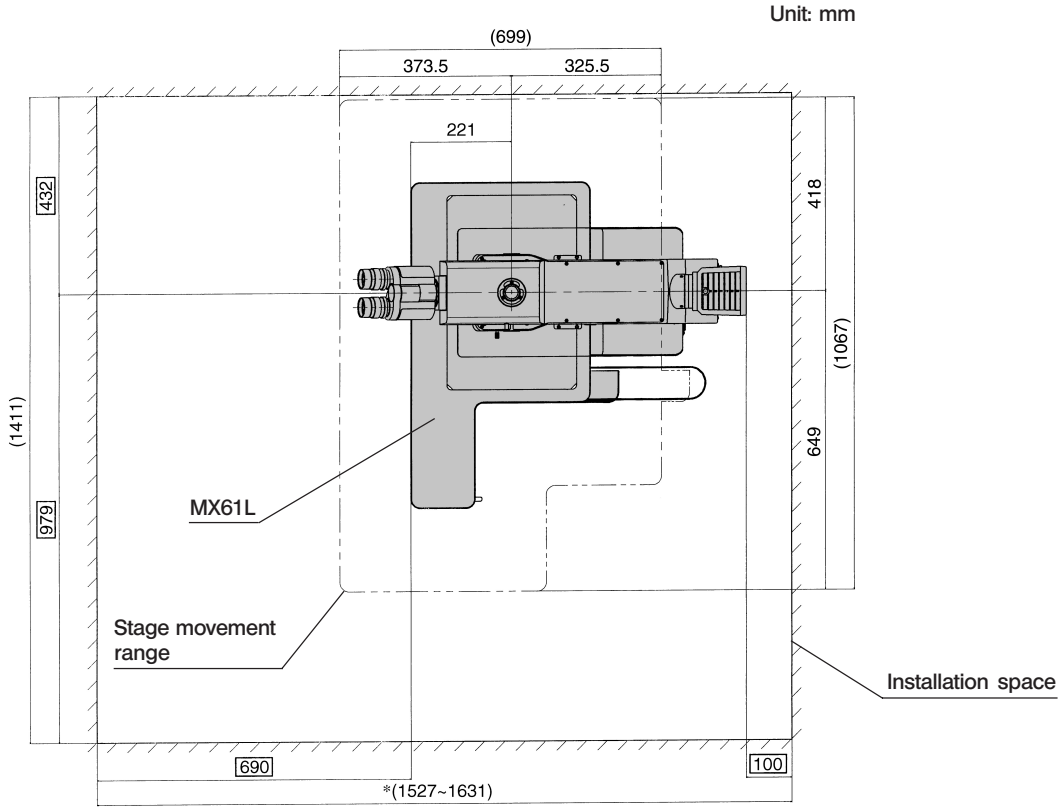
◎Always use the lamp bulb or burner supplied by Olympus.

Bulb/Burner	Model	Average Life
Halogen bulb	• 12V100WHAL-L (Long life type) (PHILIPS 7724)	2000 hrs.
	• 12V100HAL (High-resolution type) (PHILIPS 7023)	50 hrs.
Mercury burner	• USH-103OL (USHIO)	300 hrs.
	• HBO103W/2 (OSRAM)	300 hrs.
Xenon burner	• UXL-75XB-A (USHIO)	200 hrs.
Halogen bulb for light guide light source	• JCR12V-100WB (USHIO)	1000 hrs.

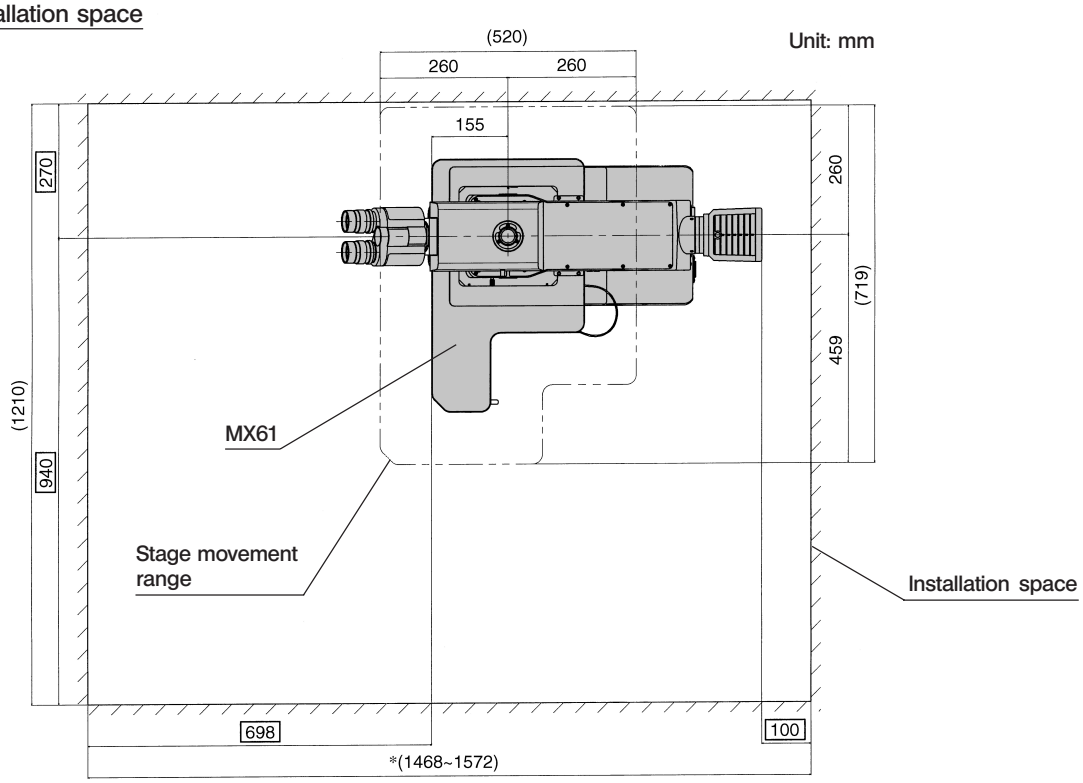
3. Do not light the mercury or xenon burner while it is not mounted on the microscope because the UV rays in their light are harmful to your eyes. The used mercury burner should be disposed of as an industrial waste. If you cannot dispose of it properly, contact Olympus.
4. The eye point of this microscope can be adjusted in the range between 408 and 560 mm above the desktop surface. Prepare a microscope desk with an optimum height for the application of the customer.

5. The desktop surface on which the microscope system is installed should be almost horizontal with a tilting angle of less than 20' with the MX61L or less than 1° with the MX61 (to prevent spontaneous displacement of the stage) and rigid. (The weight of the microscope system with standard module combination is about 53 kg, or 116.6 lbs, with the MX61L and about 44 kg, or 96.8 lbs, with the MX61.)
   ◎Although these microscopes are designed with excellent vibration resistance, their maximum performance can be achieved when an anti-vibration bench is used.)
6. The lamp housing surface at the rear of the microscope frame will become very hot during operation. When installing the microscope, ensure that there are ample free spaces (of more than 100 mm) around and in particular above and below the lamp housing. Also, the power cord and other cables should be laid out at distances from the microscope because contact with them may result in their fusion and an electric shock due to it.
7. To avoid a potential shock hazard, make sure that the power cord is safety **grounded/earthed**.
8. To allow each microscope manifest its full performance, reserve an installation space having the minimum dimensions described below before assembly and installation of the microscope. (Sizes in ▭)
   ◎The dimensions of the area enclosed in alternate long and two short dashes lines indicate the stage movement range. The dimensions marked * are variable depending on the lamp housing used.
   ◎When maintenance is required, a larger work space can be prepared by changing the observation tube orientation or moving the stage.
   ◎The following installation space is set according to the SEMI standard guidelines (SEMI S8-1103). It is recommended that you set the optimum installation space for each customer by referring to the following installation space data as well as the appearance of the system, eye point height, etc.

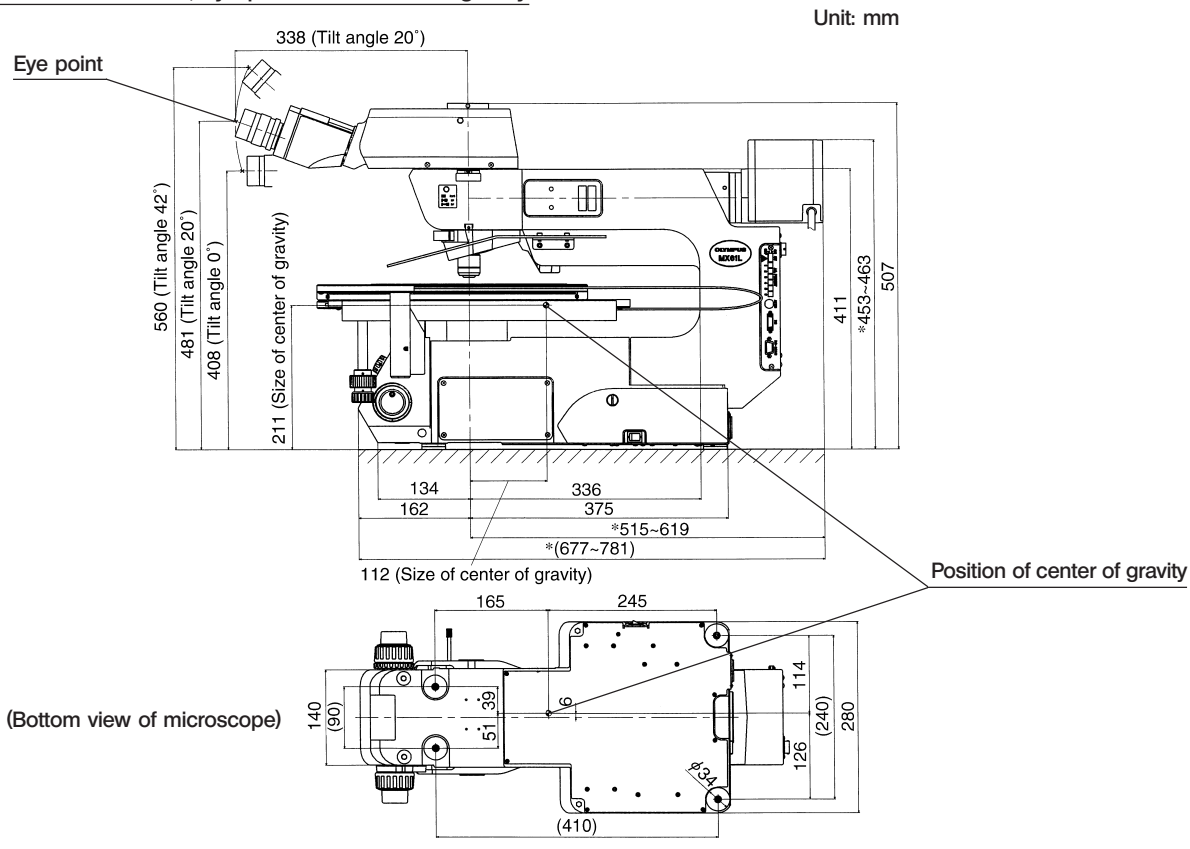
MX61L installation space



MX61 installation space

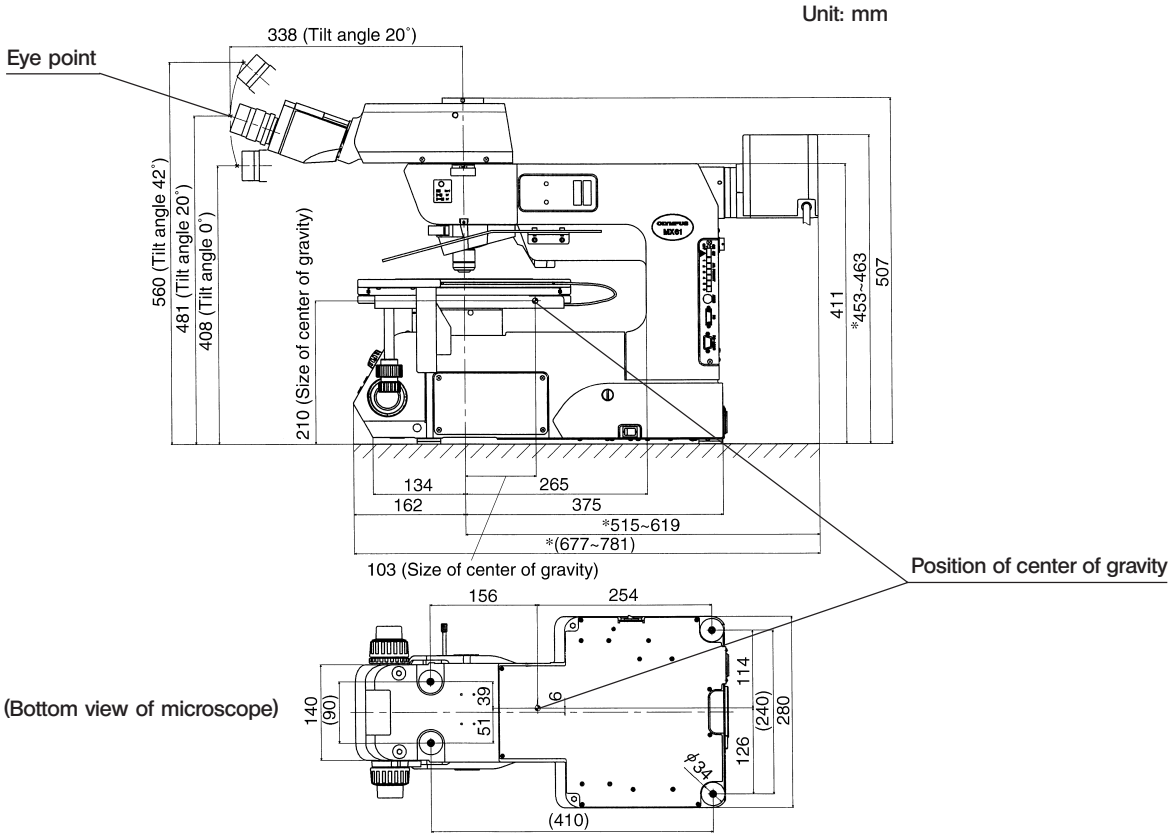


MX61L external view, eye point and center of gravity



(Note) The center of gravity is an approximate position when the microscope is equipped with the standard module combination for transmitted light observation. Note that the position is variable depending on the weight of specimen, position of the stage and other modules used.

MX61 external view, eye point and center of gravity



(Note) The center of gravity is an approximate position when the microscope is equipped with the standard module combination for transmitted light observation. Note that the position is variable depending on the weight of specimen, position of the stage and other modules used.

9. To prevent toppling of the microscope system, keep the total height of the microscope below 1 meter (3.3 ft) when attachments (including Olympus optional modules and the CCD camera prepared by the customer) are mounted.

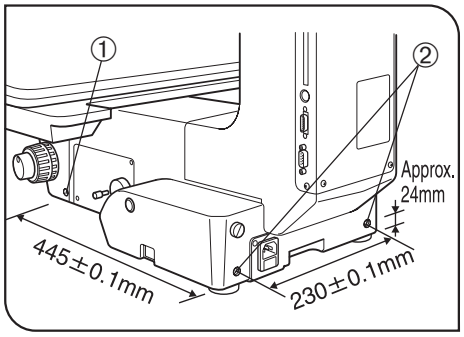


Fig. 2

10. Each microscope has screw holes (M5, depth 10 mm) for prevention of toppling (in the case of an earthquake or microscope imbalance) on the side panels ① (x 2 holes) and the rear panel ② (x 2 holes). Clamp the microscope using L-shaped clamps and these screw holes as required.

⚠When clamping the microscope using L-shaped clamps prepared by the customer, be sure to use steel bolts (strength category 12.9) with as long as possible threaded sections (8 mm or more is recommended).

Safety Symbols

The following symbols are found on the microscopes. Study the meaning of the symbols and always use the equipment in the safest possible manner.

Symbol	Explanation
	Indicates that the surface becomes hot, and should not be touched with bare hands.
	Before use, carefully read the instruction manual. Improper handling could result in injury to the user and/or damage to the equipment.
	Indicates a potential fire hazard; when replacing fuses, be sure replacement fuses are of the specified rating.
I	Indicates that the main switch is ON.
O	Indicates that the main switch is OFF.

Caution indications

Caution indications are affixed at parts where special precaution is required when handling and using the microscope. Always heed the cautions.

Caution indication positions	Lamp housing/power supply unit	[High temperature caution]	
	Light guide light source (LG-PS2)	[High temperature caution]	

1 Getting Ready

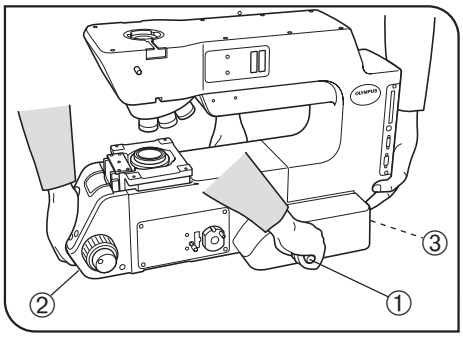


Fig. 3

1. Do not use the microscope where it is subjected to direct sunlight, high temperature and humidity, dust or vibrations. (For the operating conditions, refer to chapter 8, "SPECIFICATIONS " in the Instruction Manual.)
2. A microscope is a precision instrument. Handle it with care and avoid subjecting it to sudden or severe impacts. Never attempt to rotate the motorized revolving nosepiece by hand; otherwise, the gear or other parts may be damaged.
3. When moving the microscope, detach the observation tube, stage, lamp housing and specimen to reduce the total system weight, and then insert the two provided carrying rods ① firmly into the left and right side panels. Two persons are needed to carry the microscope; one should hold the front holding section ② and a carrying rod and the other person should hold the rear holding section ③ and the other carrying rod. Be sure to move the microscope cautiously. (The microscope frame weight is about 30 kg, or 66 lbs.)

◎After movement, remove the carrying rods, and either have the customer retain them without losing or attach them to the two screw holes on the rear of the microscope. Attach the provided screw hole caps to the screw holes left by removing the carrying rods.

★Do not change the position of the microscope by sliding it on the desktop surface; otherwise, the rubber feet will be damaged.

4. Be sure to attach the transport clamping plate(s) to the stage before transporting it.

2 Maintenance and Storage

1. To clean the lenses and other glass components, simply blow dirty away using a commercially available blower and wipe gently using a piece of cleaning paper (or clean gauze).
   If a lens is stained with fingerprints or oil smudges, wipe it gauze slightly moistened with commercially available absolute alcohol.

⚠Since the absolute alcohol is highly flammable, it must be handled carefully.
Be sure to keep it away from open flames or potential sources of electrical sparks — for example, electrical equipment that is being switched on or off. Also remember to always use it only in a well-ventilated room.

2. If any part of the equipment (other than glass components) gets dirty, with it with a clean cloth.
   If the party is extremely dirty, do not attempt to use organic solvents to clean it; instead, use a soft, lint-free cloth slightly moistened with a diluted neutral detergent.
3. Never disassemble any part other than instructed of the microscope. This could result in malfunctions or reduced performance.
4. When not using the microscope, keep it covered with a dust cover. Make sure the lamp housing is cool before covering the microscope.
5. When disposing of the microscope. Check the regulations and rules of your local government and be sure to observe them.

3 Applicable Standards

1. These devices are in compliance with or certified by the following standards.
2. Although these devices are designed for use in industrial environments, their full performances may not be manifested if they are not operated properly. Be sure to handle them properly as instructed in this manual.

These devices are designed for use in industrial environments (Class A devices).
Using them in a residential environment may affect other equipment in the environment.

CE marking

This device complies with the requirements of both directive 89/336/EEC concerning electromagnetic compatibility and directive 73/23/EEC concerning low voltage. The CE marking indicates compliance with the above directives.

FCC

These devices have been subjected to the compliance evaluation of the following FCC regulation:

- FCC Part 15, Subpart B: Radio Frequency Equipment (Commercial and industrial areas)

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC WARNING: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

SEMI

These devices have been subjected to the compliance evaluations of the following guidelines under the S8 Standard.

- S2-0703: Safety Guidelines for Semiconductor Manufacturing Equipment
- S8-1103: Safety Guidelines for Ergonomics Engineering of Semiconductor Manufacturing Equipment

4 Caution

If the microscope is used in a manner not specified by this manual, the safety of the user may be imperiled. In addition, the equipment may also be damaged. Always use the equipment as outlined in this manual.

The following symbols are used to set off text in this instruction manual.

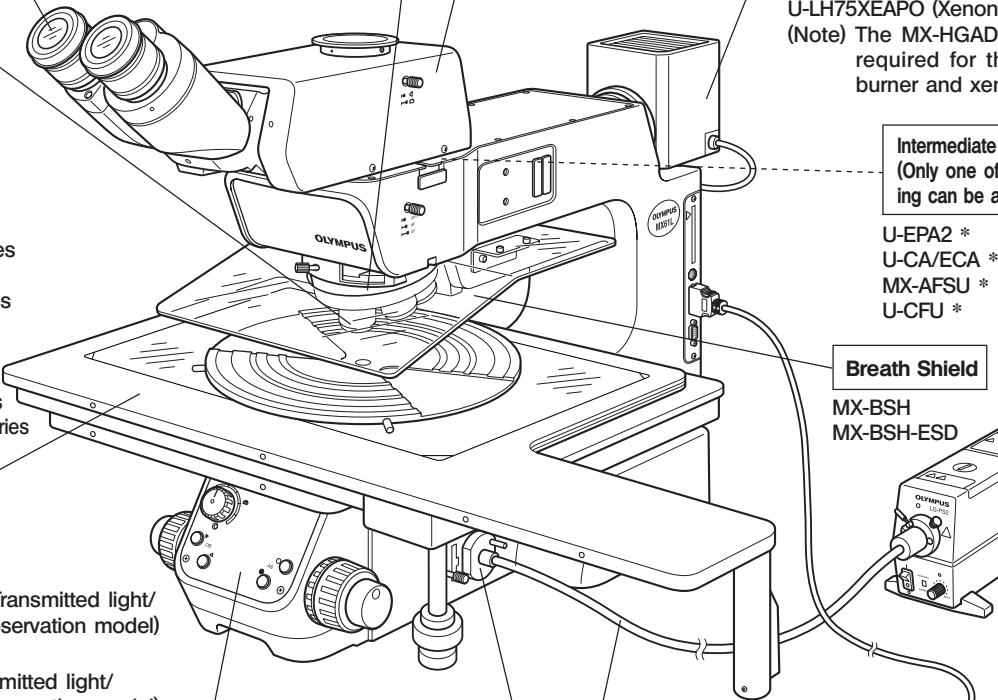
▲ : Indicates that failure to follow the instructions in the warning could result in bodily harm to the user and/or damage to equipment (including objects in the vicinity of the equipment).

★ : Indicates that failure to follow the instructions could result in damage to equipment.

◎ : Indicates commentary (for ease of operation and maintenance).

1 NOMENCLATURE

◎The illustration shows the MX61L.
◎The modules shown below are examples of those used in a typical system. Certain modules are usable even when they are not mentioned below. For these modules, refer to the latest catalogues or contact Olympus.
For the modules marked *, refer to their instruction manuals.



Observation Tube
(MX61L)
MX-SWETTR (FN 26.5)
(MX61)
MX-SWETTR (FN 26.5)
U-SWTR-3 (FN 26.5)
U-TR30-2 (FN 22)
U-BI30-2 (FN 22)

Motorized Revolving Nosepiece
U-D5BDREMC
U-D6REMC
U-P5REMC

Eyepieces
SWH Series
(FN 26.5)
WHN/WH Series
(FN 22)

Objectives
MPLFLN/
MPLFLN-BD
LMPLFLN/
LMPLFLN-BD
MPLN/
MPLN-BD
UMPlanFI/
UMPlanFI-BD Series
LMPlanFI/
LMPlanFI-BD Series
MPlanApo/
MPlanApo-BD Series
LMPlanApo/
LMPlanApo-BD Series
MPlan/MPlan-BD Series

Lamp Housing
U-LH100-3/LH100L-3 (Halogen bulb)
U-LH100HG/LH100HGAPO
(Mercury burner)
U-LH75XEAPO (Xenon burner)
(Note) The MX-HGAD adapter is required for the mercury burner and xenon burner.

Intermediate Attachment (Only one of the following can be attached.)
U-EPA2 *
U-CA/ECA *
MX-AFSU *
U-CFU *

Breath Shield
MX-BSH
MX-BSH-ESD

Stage
(MX61L)
MX-SIC1412R2 (Transmitted light/ reflected light observation model)
(MX61)
MX-SIC8R (Transmitted light/ reflected light observation model)
MX-SIC6R2
(Reflected light observation only)
MX-SIC6A
(Reflected light observation model)

Transmitted Light Module
MX-TILLA
MX-TILLB

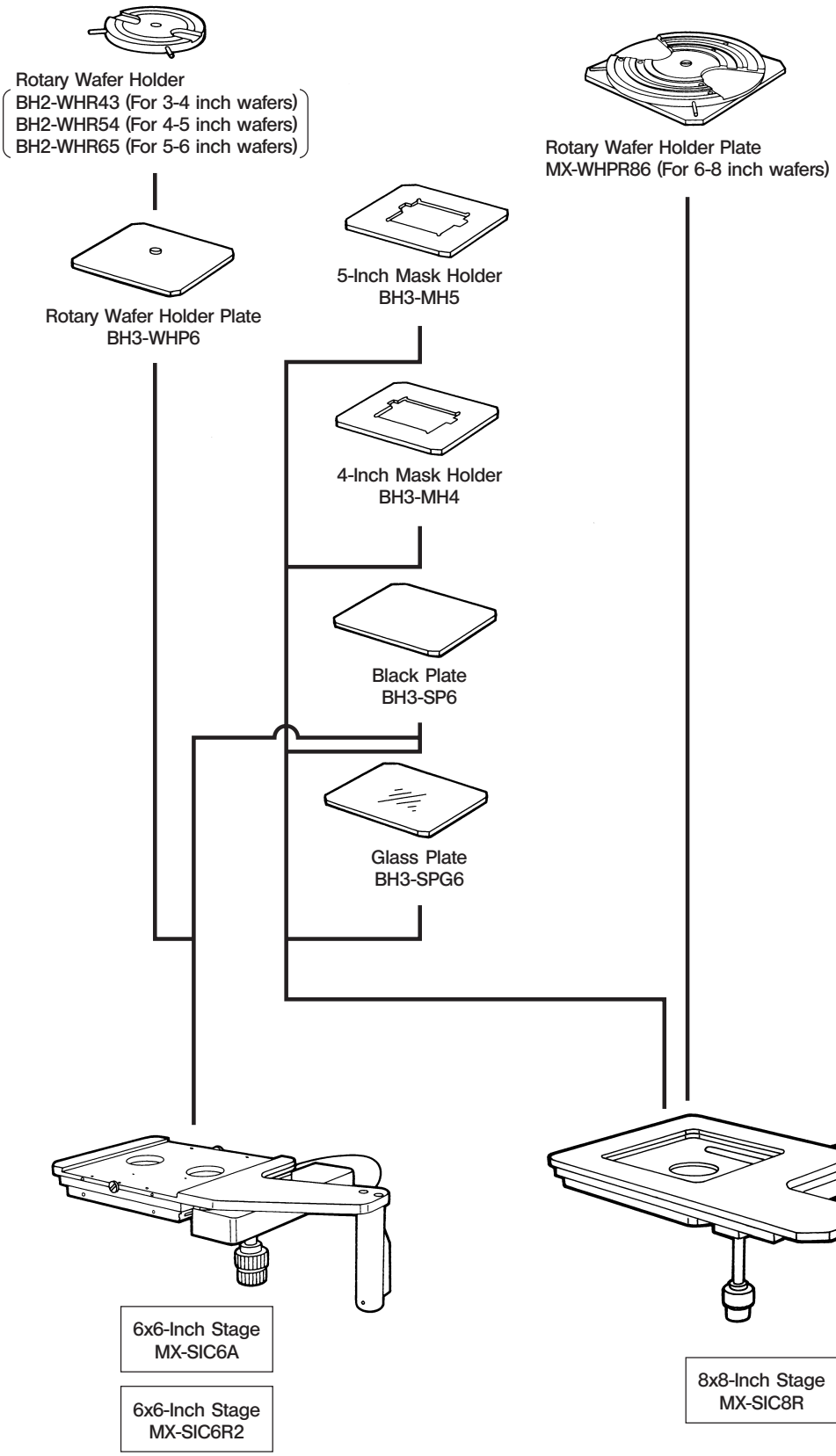
Light Source
LG-PS2 *

Hand Switch
U-HSTR2

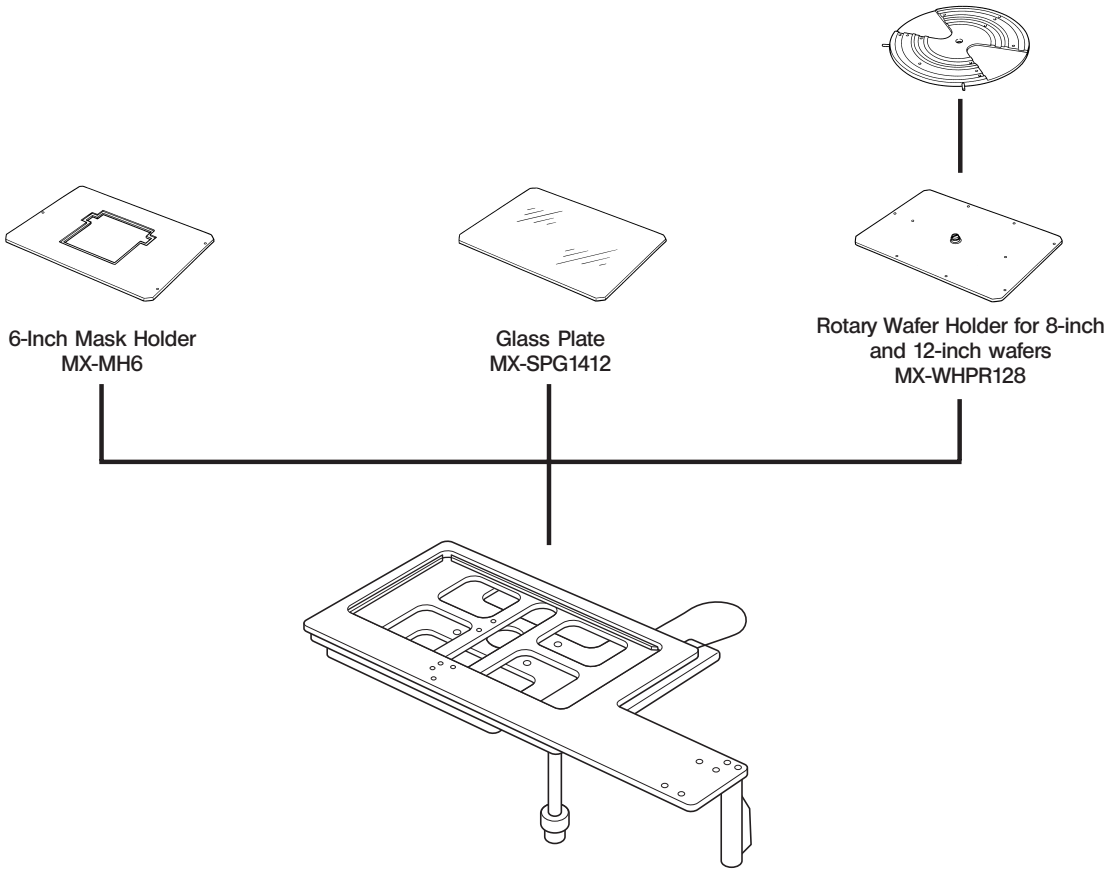
Microscope Frame
MX61L-F
MX61-F

Flexible Light Guide
LG-SF *

Stage and Holder System for the MX61



Stage and Holder System for the MX61L



2 ASSEMBLY

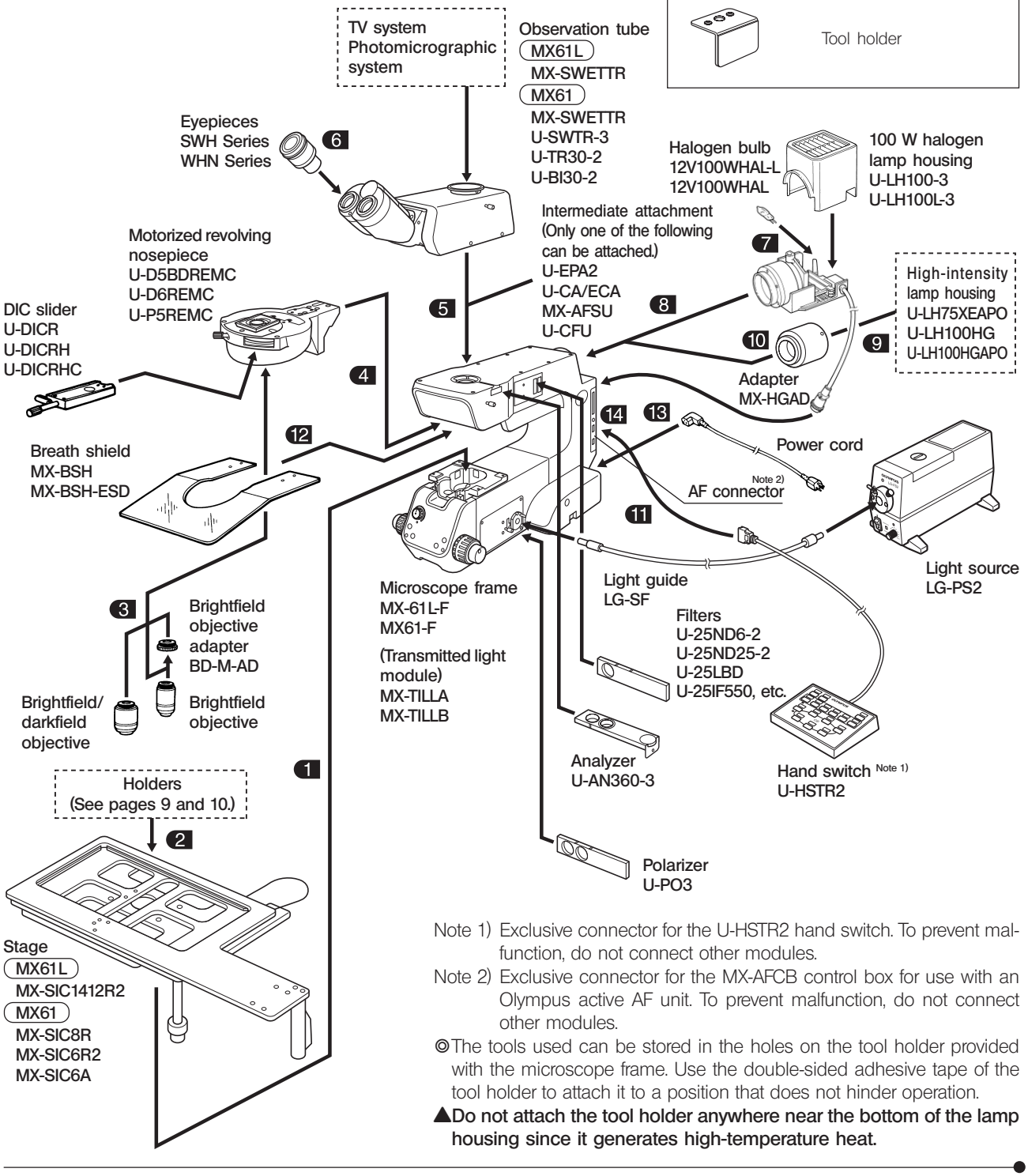
2-1 Assembly Diagram

◎The diagram below shows where the various modules should be mounted. Study the assembly instructions for only the modules to be employed.

★**When assembling the equipment, make sure that all parts are free of dust and dirt and avoid scratching any parts or touching glass surfaces.**

Tools Used
(Provided with the microscope frame)

- Allen screwdriver (3 mm)
- Allen wrench (3 mm)
- Tool holder



Note 1) Exclusive connector for the U-HSTR2 hand switch. To prevent malfunction, do not connect other modules.

Note 2) Exclusive connector for the MX-AFCB control box for use with an Olympus active AF unit. To prevent malfunction, do not connect other modules.

◎The tools used can be stored in the holes on the tool holder provided with the microscope frame. Use the double-sided adhesive tape of the tool holder to attach it to a position that does not hinder operation.

▲**Do not attach the tool holder anywhere near the bottom of the lamp housing since it generates high-temperature heat.**

2-2 Detailed Assembly Procedures

▲The system contains motorized parts. Do not plug in the power cord until all of the assembly procedures have completed.

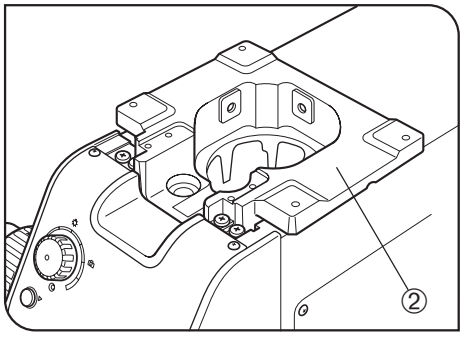


Fig. 4

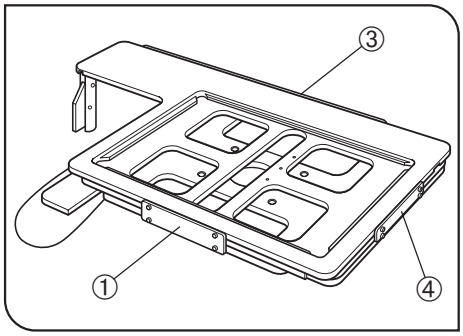


Fig. 5

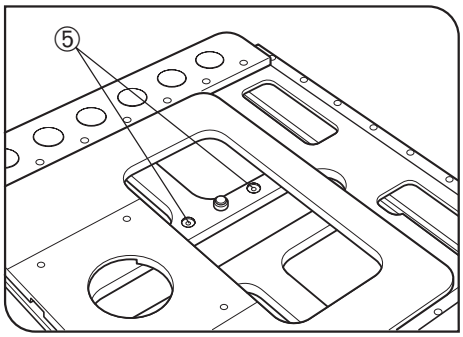


Fig. 6

1 Attaching the Stage (Figs. 4 & 5)

1. Using the Allen wrench (3 mm), remove the transport clamping plate ① from the rear edge of the stage. (Fig. 5) The removed screws should be used to clamp the stage when attaching it.

◎With the MX-SIC6R2/SIC6A, the mounting screw holes are invisible unless the upper stage is displaced. It is therefore necessary to remove the transport clamping plates from the front and rear of the stage.

★Two transport protection sheets are placed in the gaps of the MX-SIC6A/SIC6R2/SIC8R stage. Be sure to remove them before using the system.

2. While holding the stage so that the coarse adjustment grip and X-axis/Y-axis knobs are on the right, gently place the stage on the stage holder ②. Using the Allen screwdriver or Allen wrench, tighten the four screws temporarily.
3. Remove the transport clamping plate(s) from the front ③ and side (MX-SIC1412R2 only) ④ of the stage, move it to the rearmost position and, after confirming that the stage and arm do not interfere with each other, tighten the four screws firmly. (Fig. 5)

★The clutch and belt may stick together and prevent smooth operation of the release function if the stage has not been moved for a long time. If this phenomenon occurs, take the remedial action described in page 22 in the instruction manual.

Attaching the Y-Stroke Limit Stopper (Fig. 6)

◎When the MX-SIC1412R2 stage is used in transmitted light observation (possible only when the MX-TILLA is used), it is required to attach this stopper for limiting the Y-axis stroke to 10 inches in order to prevent interference between the stage and the projected part of the condenser.

1. Place the stage upside down and remove both transport clamping plates.
2. Move the stage and insert the stopper, provided with the stage, into the two stopper holes ⑤ on the center stage.
3. Attach only the front transport clamping plate and then attach the stage.

Caution Before Transporting the Stage (Fig. 5)

Before transporting the stage, be sure to attach the transport clamping plates ①③④ and package the stage carefully. Do not transport the stage when it is attached to the microscope frame or inadequately packaged. Otherwise, the stage will be damaged.

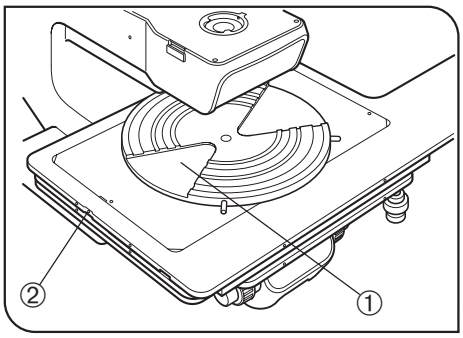


Fig. 7

2 Attaching the Holders (Figs. 7 & 8)

★Attach a holder in the direction so that the notch on the holder's side faces left. The adjustment of the levelness is performed in this direction.

Attaching the Wafer Holder (Fig. 7)

1. Insert the wafer holder plate ① into the stage, one edge first.
2. Push the wafer holder plate from above to make sure that it sits correctly with no tilt.
3. Using a flat-blade precision screwdriver, clamp the plate by tightening the holder clamping screw ② on the left side of the stage.

★The levelness of the holder is adjusted by the heights of the three screws on the back side of the stage. Do not push positions near the holder, for this may tilt the holder.

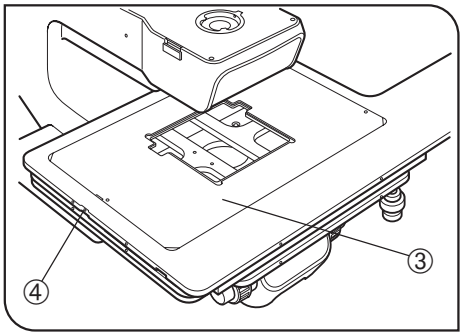


Fig. 8

Attaching the Mask Holder (Fig. 8)

1. Carefully place the mask holder ③ on the stage surface, making sure that it sits correctly with no tilt.
2. Using the precision screwdriver, clamp the plate by tightening the holder clamping screw ④ on the left side of the stage.

Attaching the Black Plate/Glass Plate

Carefully place the plate on the stage surface, and tighten the holder clamping screw on the left side of the stage.

★When attaching the glass plate, do not tighten the clamping screw excessively as the glass plate may break. Tighten to the extent that the glass plate does not rattle noticeably when attached.

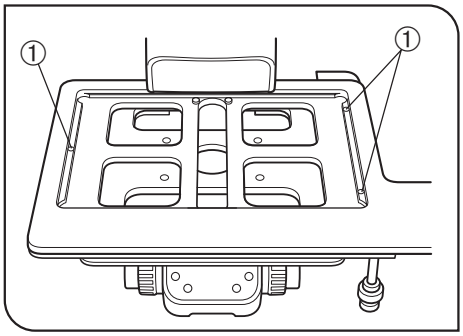


Fig. 9

Adjusting the Levelness of Holder Plate (Fig. 9)

The levelness of the stage travel (movement) and the top surface of the wafer holder have been adjusted at the factory. If finer adjustment is required or when using a holder from a manufacturer other than Olympus, apply drops of alcohol on screws ① to loosen the screw lock, then adjust the heights of the screws by inserting a flat-bladed screwdriver from below.

★The maximum loads of the stages including the holders are as follows.

MX-SIC8R/MX-SIC6R2/MX-SIC6A : 2 kg (4.4 lbs.)
MX-SIC1412R2 : 3.5 kg (7.7 lbs)

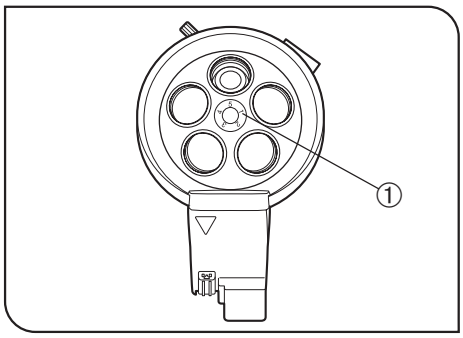


Fig. 10

3 Attaching the Objectives (Fig. 10)

★ **Never attempt to rotate the motorized revolving nosepiece by hand. Rotating by hand may cause malfunction or damage.**
Remove the cap from each objective mount hole.

1. Following the order of numbers 1 to 5 or 6 indicated on the objective mount thread ①, screw objectives into the objective mount threads by starting with the objective with the lowest power.

★ **The rotation of the revolving nosepiece can be made smooth by mounting objectives uniformly in all of the nosepiece positions. Therefore, the objectives that are not used frequently should also be mounted.**
Be sure to attach the caps to the unused objective mount hole.

Using the Brightfield Objective Adapter

When mounting a brightfield objective on a revolving nosepiece designed for brightfield/darkfield objectives, mount each objective by means of the BD-M-AD objective adapter.

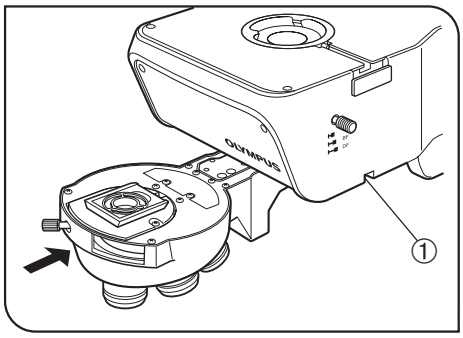


Fig. 11

4 Attaching the Motorized Revolving Nosepiece (Fig. 11)

★ **It is only the U-D5BDREMC, U-D6REMC or U-P5REMC revolving nosepiece that can be used.**

★ **Lower the stage far enough to ensure that the objectives do not touch the stage when mounting the revolving nosepiece.**

★ **Slide the revolving nosepiece all the way into the dovetail mount until it stops.**

★ **The revolving nosepiece is a heavy module. Take care not to drop it during mounting.**

1. Loosen the revolving nosepiece clamping screw ① using the provided Allen screwdriver, slide the revolving nosepiece all the way into the dovetail mount until it stops, and tighten the clamping screw ①.

★ **If the clamping screw is tightened without sliding the revolving nosepiece all the way, the clamping section may be deformed, the revolving nosepiece may become irremovable, and the connector contact failure may occur also.**

2. Set the DIP switches for the mounted revolving nosepiece (see page 20 for the setup method).

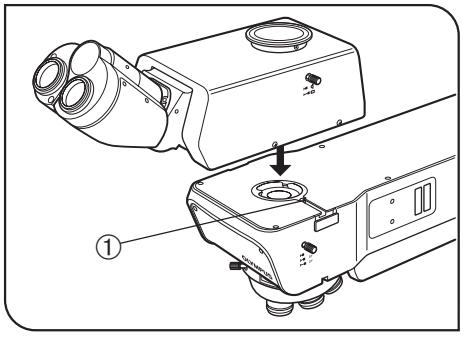


Fig. 12

5 Attaching the Observation Tube (Fig. 12)

1. Using the provided Allen screwdriver, fully loosen the observation tube clamping screw ①.
2. Insert the circular dovetail mount at the bottom of the observation tube into the observation tune mount on the top surface of the arm.
3. Clamp the observation tube by tightening the clamping screw ①.

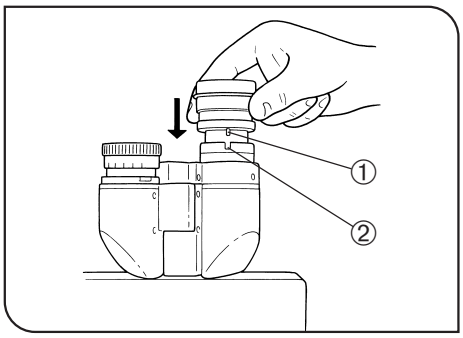


Fig. 13

6 Attaching the Eyepieces (Fig. 13)

Fit and insert gently an eyepiece into each eyepiece sleeve.

★ **When using the U-BI30-2 binocular observation tube, an eyepiece incorporating the eyepiece micrometer disk cannot be used.**

★ **When using a finder eyepiece or an eyepiece with micrometer disk, insert into the right eyepiece sleeve.**
Insert the eyepiece so that its positioning pin ① fits into the groove ② at the bottom of the eyepiece sleeve.

★ **The super-widefield observation tube has the eyepiece positioning grooves. Be sure to fit the positioning pins into the grooves on both eyepiece sleeves when mounting the eyepieces.**

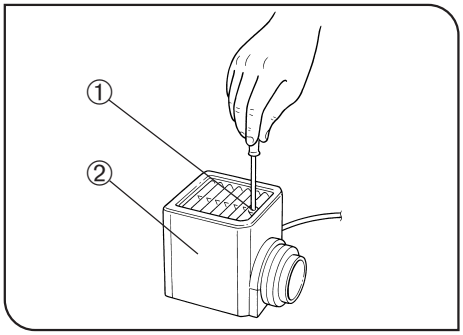
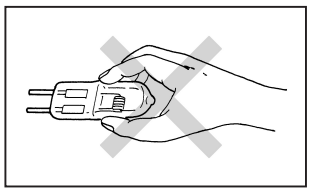


Fig. 14

7 Attaching the Halogen Bulb (Figs. 14 to 16)

◎The applicable halogen bulbs are the 12V100WHAL-L long-life bulb (PHILIPS 7724) and the 12V100WHAL high-intensity bulb (PHILIPS 7023).

1. Using the Allen screwdriver provided with the microscope, fully loosen the clamping screw ① on the top of the lamp housing.
2. Lift the lamp housing ② to remove.
3. Tilt the lamp socket ③ by 90° in the direction of the arrow.
4. While holding down the lamp clamping lever ④, hold the halogen bulb ⑤ by means of a piece of gauze, and insert the pins ⑥ all the way into the pin holes ⑦.
   Return the lamp clamping lever to the original position to clamp the bulb.



▲Do not touch the bulb directly with bare hand. If fingerprints are attached on it, wipe thoroughly with a soft cloth to prevent the service life from dropping and the bulb from cracking.

5. Fit the lamp housing ② from above and tighten the clamping screw ① while pushing down the screw by force. (Fig.14)

▲Bulb replacement during use or right after use

The bulb. lamp housing and areas near these will be extremely hot during and right after use.
After setting the main switch to " O " (OFF) and unplugging the power cord from the power outlet, allow the old bulb and lamp socket to cool before replacing the bulb with a new one of the designated type.

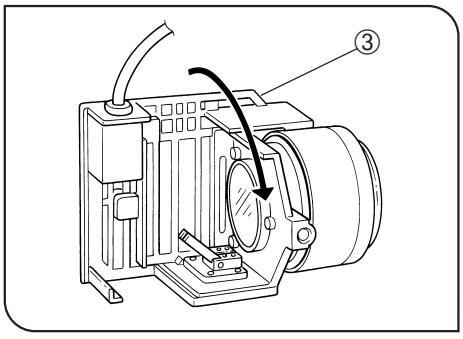


Fig. 15

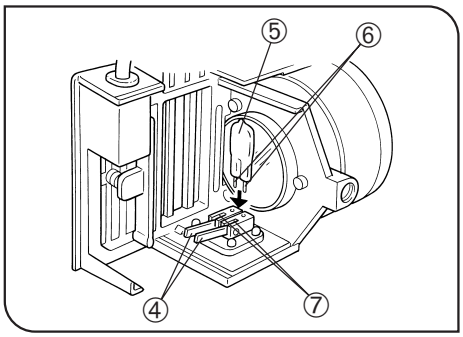


Fig. 16

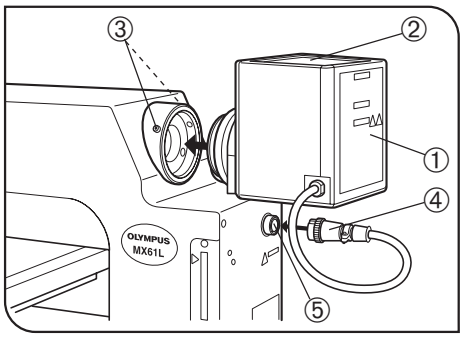


Fig. 17

8 Attaching the Lamp Housing (Fig. 17)

1. Fit the lamp housing ① all the way into the lamp housing mount on the rear of the microscope arm.

▲**Attach the lamp housing so that the heat radiating fins ② face upward. To prevent a fire hazard, reserve ample spaces above, below and on the rear of the lamp housing.**

2. After fitting the lamp housing ①, tighten the two clamping screws ③ using the Allen screwdriver provided with the microscope.

★**Do not tighten the screws too much, as this may deform the lamp housing mount.**

3. Connect the connector ④ of the lamp housing to the connector ⑤ on the rear of the arm.

9 Attaching the Mercury Burner (Figs. 18 to 23)

◎For the xenon burner, attach the burner, reset the hour counter and connect the cables as described in the manual provided with the light source in use.

1. Loosen the socket clamping screw ① using the Allen screwdriver.
2. Hold the upper section of the lamp housing and pull it upward to remove the socket section.

★**To prevent malfunction, do not hold the lamp housing by the centering knobs ②.**

3. Place the socket section upside down as shown in Fig. 19.

◎The lamp housing is equipped with the holder for transportation in the factory shipment condition or with an old burner when the burner is replaced. Remove the holder or old burner by loosening the two burner holding screws ③.

4. Attach the + (positive) pole of a specified mercury burner ④ to the fixed mount on the upper side, then the - (negative) pole to the mount on the lower side.

★**Be sure to use the USH-103OL (USHIO) or the HBO103W/2 (OSRAM) mercury burner.**

★**Be careful and avoid leaving fingerprints or contaminants on the mercury burner. Otherwise, there is a danger of explosion due to distortion of glass caused by the stains. If the burner is contaminated, clean it by wiping gently with gauze slightly moistened with absolute alcohol.**

5. Attach the socket section with burner to the original position and tighten the socket clamping screw ①.

★**Align the external edges of the lamp housing with those on the socket section, and push the lamp housing straight downward.**

▲**Attach the lamp housing so that the heat radiating fins face upward. To prevent a fire hazard, reserve ample spaces above, below and on the rear of the lamp housing.**

▲**Do not light the mercury burner while it is not mounted on the microscope because the UV rays in its light are harmful to your eyes.**

★**The UV rays in the light of the mercury burner may damage the specimen if this is sensitive to UV rays.**

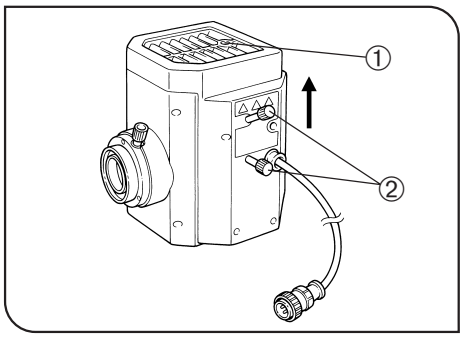


Fig. 18

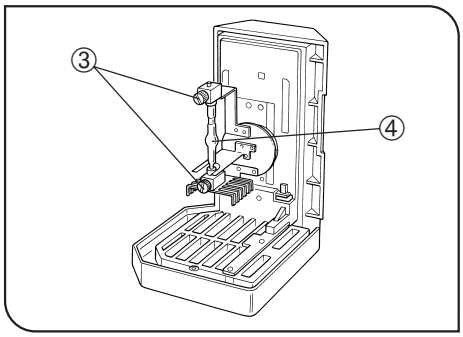


Fig. 19

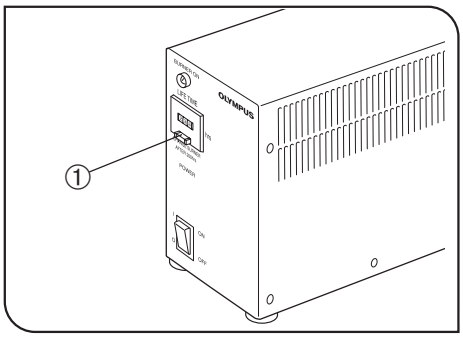


Fig. 20

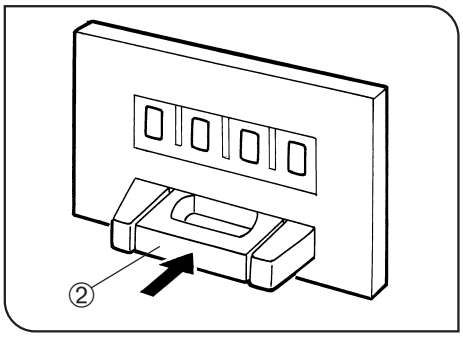


Fig. 21

Resetting the Burner Hour Counter

1. Press the center section ① of the reset switch ② on the front panel to reset the counter reading to "000.0".

◎The hour counter shows elapsed time in hours. The service life of a mercury burner is 300 hours. For safety's sake, replace the burner when the hour counter reads "300.0".

▲ Mercury Burner Replacement

1. The service life of the mercury burner is 300 hours. In order not to impair the safety of the equipment, replace the burner when it has been used for 300 hours (USH-103OL, HBO103W/2). The burner may crack if used beyond the specified life time.
   When the end of the burner's service life is near, flickering is likely to increase. It is therefore recommended to replace the burner according to the purpose of observation.
   * This value assumes light cycles composed of 2 hours of lighting and 30 minutes of extinction (with the USH-103OL). Do not turn it on and off at a shorter cycle than the above, for this will shorten the service life of the burner.
2. Before replacing the burner, wait at least 10 minutes, or until the burner and lamp housing have cooled down, after turning the burner off. Before removing the burner, confirm that the main switch is "O" (OFF) and unplug the connecting cord from the output connector of the power supply.
   Refer to page 16 for details on replacement procedure.
3. After replacing the burner, reset the hour counter to "000.0" as outlined above.

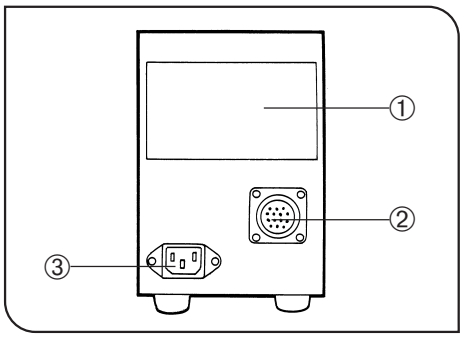


Fig. 22

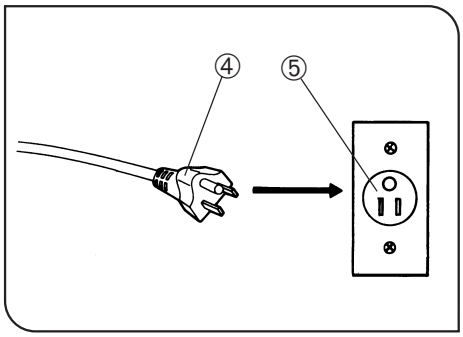


Fig. 23

Setting Up the Power Supply Unit for Mercury Burner

CAUTION **This operation should be performed after completing the attachment of the lamp housing described in the next section.**

▲Cables and cords are vulnerable to bend or twist. Do not apply excessive force to them.

▲Make sure that the main switch is set to "O" (OFF) before connecting cords and cables.

▲Always use the power cord provided by Olympus. If no power cord is provided, please select the power cord by referring to the section "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual. If the proper power cord is not used, Olympus can no longer warrant the electrical safety performance of the equipment.

1. Make sure that the voltage and frequency of the input power are within the ranges indicated on the name plate ①.
   (100 V systems can be used with voltages in the 100 to 120 V range and 200 V systems can be used with voltage in the 220 to 240 V range, both with frequencies of 50 to 60 Hz.)
2. Plug the connection cord to the connector ② on the power supply unit.
3. Attach the power cord to the power input connector ③ of the power supply unit, and plug the power plug ④ of the power cord into the wall power outlet ⑤.

▲Always ensure that the grounding terminal is safety grounded/earthed. If the equipment is not grounded/earthed, Olympus can no longer warrant the electrical safety performance of the equipment.

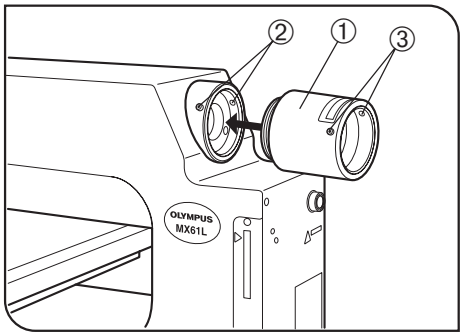


Fig. 24

10 Attaching the High-Intensity Light Source Lamp Housing (Fig. 24)

1. Fit the MX-HGAD adapter ① all the way into the lamp housing mount on the rear of the microscope arm, tighten the two clamping screws ② using the Allen screwdriver.
2. Fit the mount section of the high-intensity lamp housing into the adapter, confirm that the lamp housing is not tilted, and clamp the two clamping screws ③ using the Allen screwdriver.

▲When the high-intensity light source is used, the brightness becomes too high during brightfield observation. Be sure to install the provided ND filter (ND0.5*) in the brightfield observation light path.

* If the brightness after insertion of the ND0.5 filter is too low, use a different ND filter (ND3 and ND6 filters available as options).

◎ The ND0.5 filter provided with the lamp housing can be mounted only by the Olympus qualified personnel.

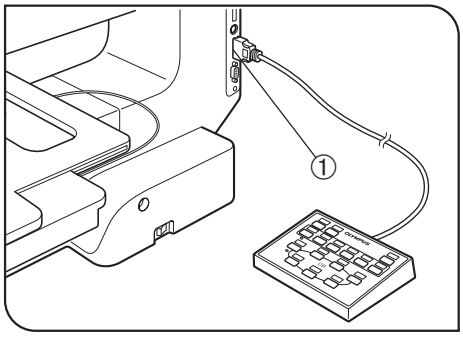


Fig. 25

11 Connecting the Hand Switch (U-HSTR2) (Fig. 25)

▲To prevent damage to the internal circuitry, always make sure that the power cord is unplugged and the main switch is set to "O" (OFF) before connecting or disconnecting the hand switch.

Plug the hand switch connecting cable into the socket ① on the right side of the microscope frame.

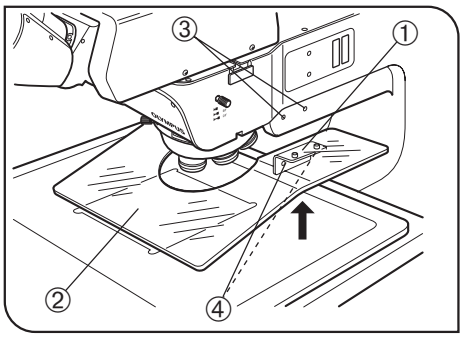


Fig. 26

12 Attaching the Breath Shield (MX-BSH or MX-BSH-ESD) (Fig. 26)

1. Attach the two breath shield mounting brackets ① on the breath shield ② using the provided screws (shorter ones). For the present, tighten the screws temporarily using the Allen screwdriver. (If they are attached completely, it becomes impossible to attach the breath shield to the microscope frame.)
2. Align the attaching holes ④ on the mounting brackets with the breath shield screw holes ③ on the microscope, and clamp using the provided screws (longer ones).
3. Now tighten the screws that have been secured temporarily in step 1 above.

★Do not tighten the screws excessively to prevent the breath shield from cracking.

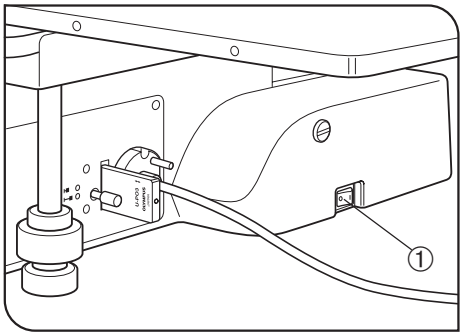


Fig. 27

13 Connecting the Power Cord (Figs. 27 to 29)

▲Cables and cords are vulnerable to bend or twist. Do not apply excessive force to them.

▲Make sure that the main switch ① is set to "O" (OFF) before connecting cords and cables. (Fig. 27)

▲Always use the power cord provided by Olympus. If no power cord is provided, please select the power cord by referring to the section "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual. If the proper power cord is not used, Olympus can no longer warrant the electrical safety performance of the equipment.

1. Connect the power cord plug ② to the AC receptacle ③. (Fig. 28)

▲Connect the provided power cord correctly and ensure that the grounding terminal of the power supply and that of the 3-conductor wall outlet are properly connected. If the equipment is not grounded/earthed, Olympus can no longer warrant the electrical safety performance of the equipment.

2. Connect the power cord plug ④ to a 3-conductor power outlet ⑤. (Fig. 29)

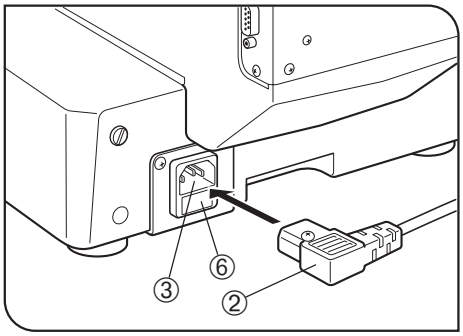


Fig. 28

Fuse Replacement

1. Always set the main switch ① to "O" (OFF) and disconnect the power cord before replacing fuses.
2. When the power cord plug is disconnected from the receptacle on the microscope frame, the fuse cassette ⑥ becomes visible. (Fig. 28).
3. Apply a flat-blade screwdriver in turn to the claws on both sides of the fuse cassette to pull the fuse cassette outward.
4. Replace the two fuses and return the fuse cassette to its original position.

Applicable Fuses : ⊟ T3.15A(H)250V
(LITTELFUSE 2153.15)

▲Use of improper fuse type could result in a fire.

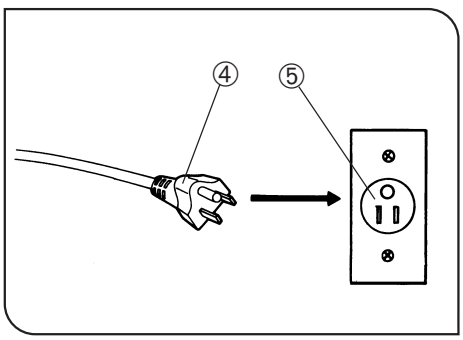


Fig. 29

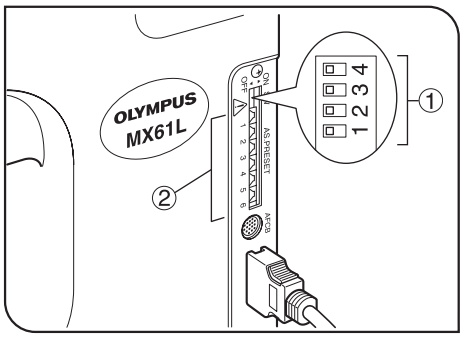


Fig. 30

14 Setting the DIP Switches and PRESET Switches (Fig. 30)

DIP Switch Setting (Fig. 30)

★**Confirm the correct connections before proceeding.**

◎Set the main switch of the microscope to "○" (OFF) before setting the DIP switch ①.
The DIP switch settings are read and entered at the moment the microscope is turned ON.

★**Be careful not touch the internal circuit boards when setting the DIP switches. Otherwise, the internal circuitry may be damaged by static electricity. Since the human body is charged with a small amount of static electricity, discharge it from your body before proceeding to the setup. This is done by lightly touching any metallic object.**

Function	Setting Result	DIP Switches			
		1	2	3	4
Revolving nosepiece type (Number of holes)	U-D5BDREMC/P5REMC	OFF			
	U-D6REMC	ON			
Aperture iris diaphragm control button setting	Setting enabled.			OFF	
	Setting disabled.			ON	
Glare prevention during objective switching (Darkfield observation)	Glare prevention				OFF
	No glare prevention				ON

: Factory setup.

AS (Aperture Stop) PRESET Switch Setting (Fig. 30)

◎The AS PRESET switches ② are used to preset the AS (aperture stop) value for each objective so that the opening of the aperture iris diaphragm can be switched in an interlocked operation to the objective switching.
In the darkfield observation, the aperture iris diaphragm is fixed automatically at the open position.
The positions of the AS PRESET switches can be changed while the main switch is set to " | " (ON).

Setting the AS values

Insert a flat-blade precision screwdriver into the AS PRESET switch ② corresponding to the number of the objective mount thread accommodating the desired objective, and turn the switch so that its arrow points the desired AS value. (See Table 1 for the recommended values.)

AS interlocking

- When using the U-HSTR2 hand switch:
  When the objective switching button on the hand switch is pressed, the objective is switched and, at the same time, the AS value is set to the value set for the new objective. If the AS switch position is changed while the main switch is set to "O" (OFF), the new AS value will be applied to each objective after the main switch is set to " | " (ON).

- When using computer control through the serial interface (RS-232C):
  When the request command (1OBA␣n) is input, the objective is switched at the same time as change of the AS value to the set value.

Table 1 Recommended Settings of the AS PRESET Switches (Positions marked ○)

(Note) The factory settings are all 0.

AS PRESET Switch Setting		MPLFLN/UMPlanFI Series MPLFLN-BD/UMPlanFI-BD/MPlanFI-BD Series					LMPLFLN/LMPlanFI Series LMPLFLN-BD/LMPlanFI-BD Series					UMPlanApo Series UMPlanApo-BD Series	
		5X	10X	20X	50X	100X	5X	10X	20X	50X	100X	150X	250X
Open AS ↑	0	AS interlocking not available											
	1												
	2												
	3	○	○										
	4			○			○	○					
	5								○				
	6				○								
	7												
	8					○				○			
	9										○		
	A											○	
	B												
	C												○
↓ Close AS	D												
	E	Not used											
	F	Not used											

(Notes)
- The recommended AS values correspond to between 70% and 80% of the objective pupil diameters. As a result, if the aperture iris diaphragm is stopped down below the recommended value (toward "D"), the observation image will be glaring.
- When using an objective not in the objective list, set the objective pupil diameter at 70% to 80%.
- Setting "0" inhibits the interlocked change of the AS value. Although the switch setting is set at "0", the AS value becomes open when brightfield observation is switched to darkfield observation. On the contrary, the AS value remains open when darkfield observation is switched to brightfield observation.
- With fluorescent light observation, set the AS value to "1" (AS open).

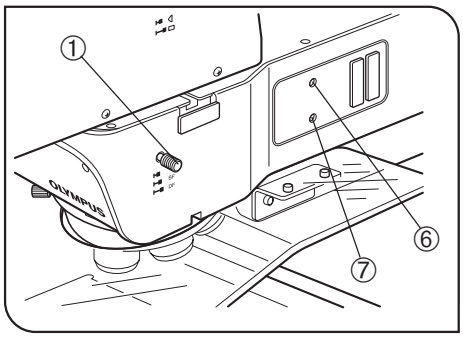


Fig. 31

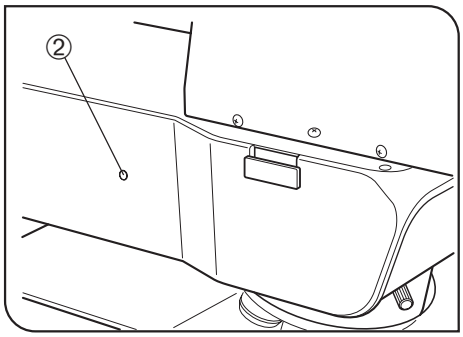


Fig. 32

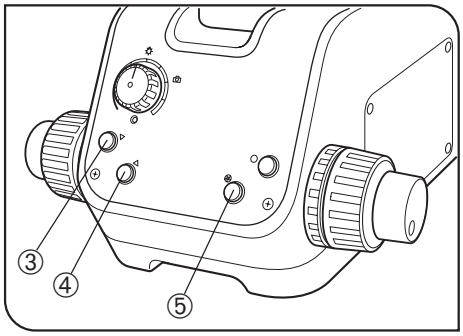


Fig. 33

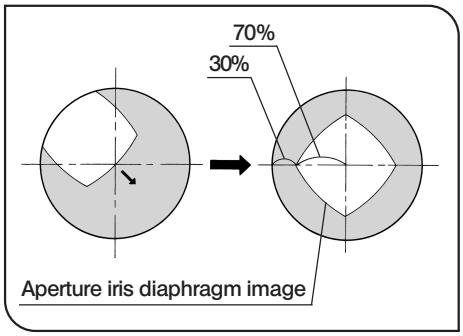


Fig. 34

15 Centering the Reflected Light Aperture Iris Diaphragm (Figs. 31 to 34)

1. Set the light path selector knob ① to "BF". (Fig. 31)
2. Press the objective switching button ③ or ④ (or switch the objective from the hand switch or computer), engage the 10X objective in the light path, and bring the specimen into approximate focus.

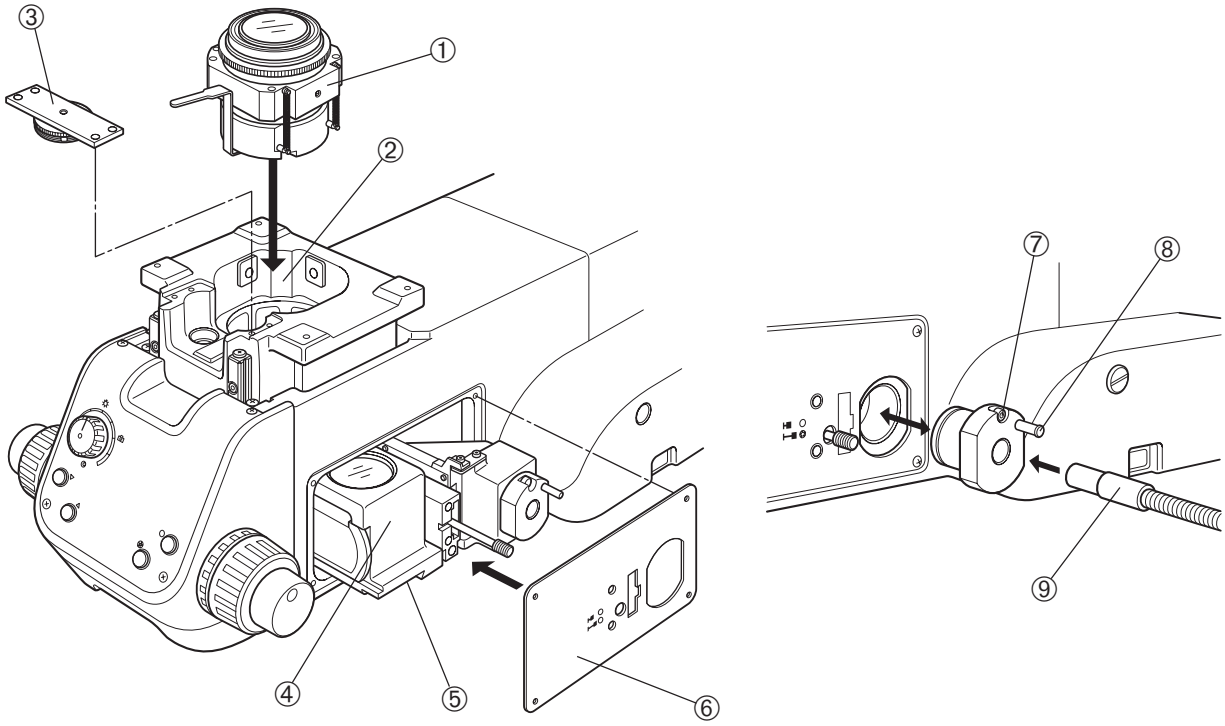
★**To facilitate observation of the aperture iris diaphragm image, it is recommended to use a highly reflective specimen such as a mirror.**

3. Remove the eyepiece and, while looking into the eyepiece sleeve, press the aperture iris diaphragm open/close button ⑤ so that the aperture iris diaphragm image is visible. (Fig. 34)
4. If the center of the aperture iris diaphragm is deviated, use the Allen screwdriver provided with the microscope to loosen (by 1 turn or 2) the aperture iris diaphragm clamping screw ②. Then insert the Allen screwdriver into the aperture iris diaphragm centering screws ⑥⑦ and turn the screws to center it.
5. Tighten the aperture iris diaphragm clamping screw ②.

2-3 Modules Installed by Olympus

The modules described in the following sections are installed and adjusted by Olympus. The user should not install and/or adjust them.
★When installing the modules, the personnel of Olympus must take caution not to put fingerprints or scratches on them.

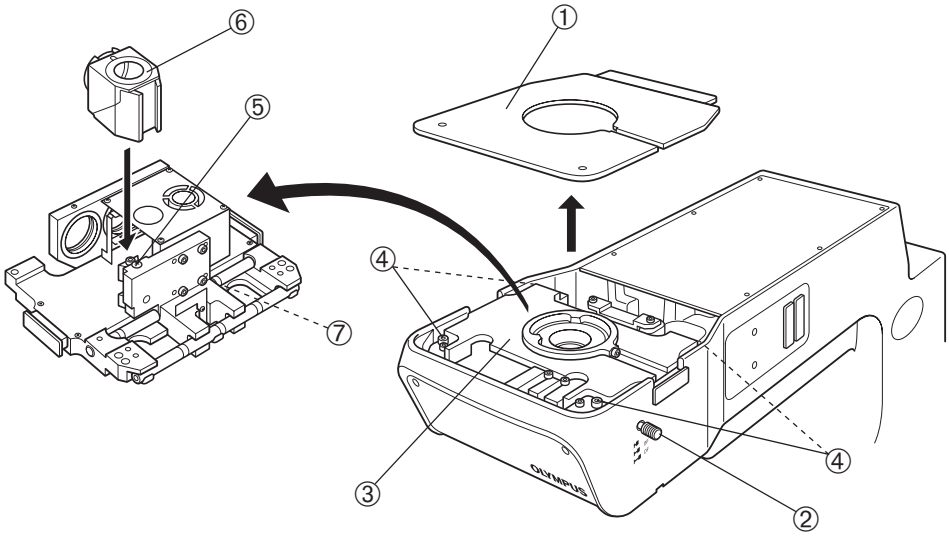
1 Transmitted Light Module (MX-TILLA/TILLB)



1. Remove the stage.
2. Insert one of the provided clamping screws (AB 3 x 25) into each of the four screw holes on the condenser ① by means of a washer, and drop the condenser in to the opening ② on the focusing block so that it faces the front direction (i.e. so that the AS lever or shutter comes on the front).
3. Place the condenser by pushing it against the left and deep directions when the microscope is seen from the front, and tighten the four clamping screws (AB3 x 25) using an Allen wrench (2.5 mm). The attaching of the type A model is now complete.
4. With the type B model, clamp the interlock section ③ of the condenser height adjustment ring into the four threaded holes on the front part of the focus adjustment section using the provided clamping screws (AB3 x 5) and Allen wrench (2.5 mm). After clamping temporarily, find the positioning with which the gear interlocking is smooth and tighten the clamping screws firmly.
5. Using a Phillips screwdriver, loosen the clamping screws (CTK3 x 6) on the cover plate on the right of the base, and remove the cover plate.
6. Raise the focus adjustment section to the highest position, align the dovetail groove ⑤ of the illuminator unit ④ with the internal dovetail, fit them all the way, and tighten the clamping screws of the internal dovetail using the Allen screwdriver. To prevent loosening the condenser, screw in the provided screws (AHU 5 x 6) additionally above the clamping screws (using the Allen wrench with a width across flats of 2.5 mm).
7. Attach and clamp the illuminator unit cover ⑥ using the clamping screws (CTK 3 x 6) so that the spaces of the openings are uniform with respect to the outward projections of the illuminator unit ④.
8. Loosen the light guide holder clamping screw ⑦ and pull out the light guide holder by holding the knob ⑧.
9. Insert the light guide ⑨ into the light guide holder and tighten the clamping screws on the side.
10. Attach the light guide holder in the original position and eighteen the clamping screw ⑦.

2 (Optional) Light Path Setup

◎If it is required to mount a reflected light filter, mount it immediately after the following operation. (See next section.)



1. Loosen the clamping screws on the top cover ① using the Allen screwdriver (2 mm), and remove the top cover.
2. Turn the light path selector knob ② counterclockwise to remove it.
   (This knob should be retained by the user because it will be reused when restoring the light path switching stroke to the original setting.)
3. Using the Allen wrench (3 mm), remove the four clamping screws (AB4 x 16) ④ of the observation light path unit ③, take out the unit ③ and place it upside down.
4. Loosen the mirror unit clamping screw ⑤ using the Allen screwdriver, insert the desired mirror unit ⑥ into the mount dovetail (so that the product name on the side of the unit is upside down), and tighten the clamping screw ⑤.
5. Using the Allen wrench (3 mm), remove the screw ⑦ limiting the light path selection stroke.
   (This screw should be retained by the user because it will be reused when restoring the light path switching stroke to the original setting.)
6. Attach and clamp the observation light path unit ③ in the original position, and also clamp the top cover ①.

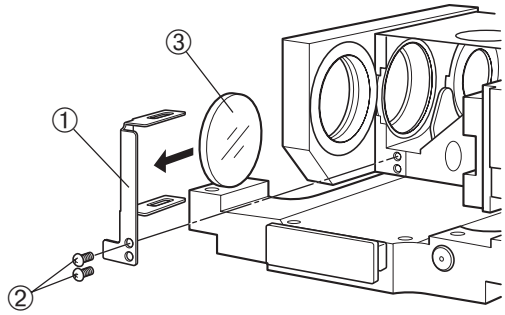
★**To clamp the observation light path unit ③, use the Allen wrench (3 mm) because this enables surer clamping than the Allen screwdriver.**

7. Screw the provided longer light path selector knob firmly into the position for the knob ②.

3 Reflected Neutral Density Filter (ND 0.5)

◎The standard filter is ND 0.5, but a ND 3 or ND 6 filter can be mounted depending on the reflecting conditions of the specimen.

1. Perform the same operation till step 3 in the procedure for section 2 .



2. Remove the two screws ② clamping the filter frame ① using a Phillips precision screwdriver and remove the filter frame ①.
3. Insert the filter ③ into the filter holding slit (long slit) of the filter frame.
   ◎The filter frame slightly deforms outward, but this is normal.
4. Attach and clamp the filter frame ① in the original position.

3 CENTRATION OF THE MERCURY/XENON BURNER

1 Turning the Burner On

Set the main switch of the power supply unit for mercury burner to " | " (ON). The arc will stabilize in 3 to 5 minutes after the burner is ignited.

★ **A discharge-type mercury or xenon burner may not turn on by the first try due to the characteristics of the burner. If a burner does not turn on, set the main switch to "○" (OFF), wait for 5 to 10 seconds and set the main switch to " | " (ON) again.**

★ **To avoid shortening the service life of the burner, do not turn a burner off in less than 15 minutes after turning it on.**

★ **When turning on a mercury burner that has been turned off, wait for about 10 minutes after it is turned off, because it cannot be turned on unless the mercury vapor in the burner has cooled down and liquefied.**

★ **If the lamp housing is opened while the burner is on, the power supply stops to ensure safety. In this case, set the main switch to "○" (OFF) and wait for more than 10 minutes before retrying to turn it on again. Do not open the lamp housing unless it has cooled down sufficiently.**

★ **When resetting the burner hour counter, press and hold the reset button until the reading becomes "000.0".**

2 Centering the Mercury Burner (Figs. 35 & 36)

◎For centering of the xenon burner, refer to the instruction manual for the U-LH75XEAPO lamp housing.

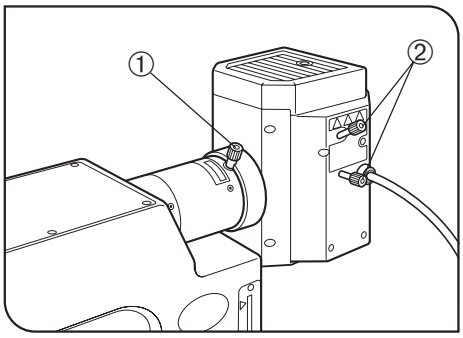
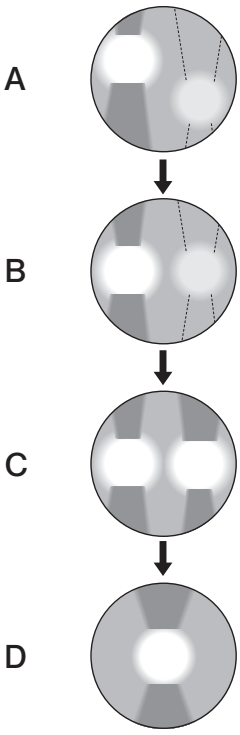


Fig. 35



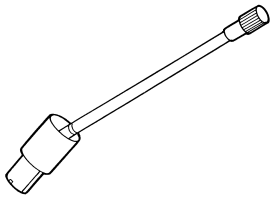
◎Set the main switch to " | " (ON) and wait until the arc image stabilizes (for 5 to 10 minutes after ignition) before proceeding to the centering.

1. Remove an objective to make an idle position on the revolving nosepiece.
2. Select the BF light path using the light path selector knob.
3. Place a piece of white paper or similar object on the stage as the specimen, and move the stage approximately to the focus plane of the objective.
4. Open the aperture iris diaphragm.
5. Rotate the collector lens focus adjustment knob ① to project the arc image on the white paper. (Fig. A)
   If the arc image is not projected, rotate the burner centering knob ②.
6. Rotate the lamp centering knob ② to move the arc image on the center of the left (right) half of the field of view. (Fig. B)
7. Fit the tip of the Allen screwdriver into the mirror focus adjustment screw ③ (Fig. 36) on the rear of the lamp housing, and rotate the screw to focus on the mirror arc image. (Fig. C)
8. Rotate the lamp centering knob ② so that the arc image and mirror arc image are overlapped. (Fig. D)

◎During observation, rotate the collector lens focus adjustment knob ① as required to render the observed field of view uniform.

◎It is not required to center the mercury burner further until the next time it is replaced.

◎If the collector lens focus adjustment knob ① is located to far to be manipulated, fit the U-CLA extension handle (optional) shown below into the knob ① and manipulate them together.



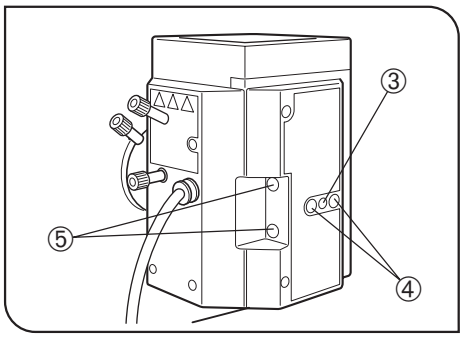


Fig. 36

Precise Centering of the Mirror

◎The position of the mirror has been adjusted and locked before shipment. Only if you want more precise adjustment of the mirror position, proceed to the following steps immediately after the procedure in the previous paragraphs.
Note that, once the following steps are completed, it is no longer possible to restore the mirror position in the factory shipped condition.

1. Using a pair of tweezers, etc., peel off the two blind stickers ④ on the rear of the lamp housing.
2. Fit the Allen screwdriver into each of the screws hidden below the sticker and loosen them. Loosening the two screws releases the locking of the mirror.
3. Peel off other two blind stickers ⑤ to expose the mirror centering holes.
4. Insert the Allen screwdriver into the screw in each mirror centering hole and adjust the centering of the mirror arc image.

4 MICROSCOPE CONTROL FROM COMPUTER

◎Connecting the MX61/61L microscope with a host computer using an RS-232C cable makes serial communications available for computer control of the microscope.

1 RS-232C Communication Parameters

◎The RS-232C communication parameters are fixed as shown below.

Transfer rate	19,200 [bps]
Data bits	8 [bits]
Parity	Even
Stop bits	2 [bits]
Flow control	None (CTS control applied only after power ON)
Terminator (Line feed code)	CR+LF (ASCII codes 0x0D, 0x0A)

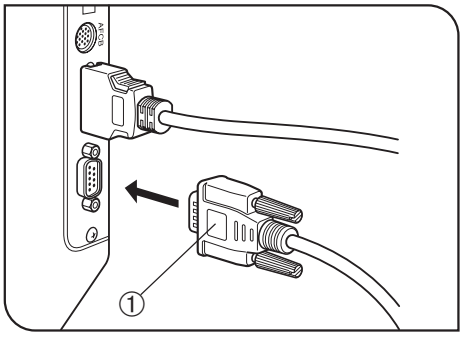


Fig. 37

2 Connection of the RS-232C Cable (Fig. 37)

⚠This connector is only for connection of a computer that corresponds to the requirements of IEC60950.

★The RS-232C cable used must be a straight cable that is commercially available. (The cable should be equipped with two D-sub 9P female-female connectors on the extremities.)

• Be sure to set the main switches of the microscope system and host computer to "O" (OFF) before connecting the RS-232C cable ①.

3 Connection of Connectors and Pin Assign

a. TXD (⇨ Transmit Data)
b. RXD (⇦ Recieve Data)
c. RTS (⇨ Request To Send)
d. CTS (⇦ Clear To Send)
e. DSR (⇦ Data Set Ready)
f. GND (Signal Ground)
g. DTR (⇨ Data Terminal Ready)

4 Communication Specifications

Command and Response

The MX61/61L receives a command from the host computer (hereinafter referred to as "the host"), executes an operation according to the command, and returns the response to the host.

Hereinafter,

the instructions transmitted from the host to the MX61/61L will be called the **commands**, and
the instructions transmitted from the MX61/61L to the host will be called the **responses**.

Request commands and query commands

The commands transmitted to the MX61/61L can roughly be categorized into two types; the request commands and query commands.

Request commands: Commands requesting an operation or setting of the MX61/61L.
Query commands: Commands for checking the present status of the MX61/61L.

Remote Mode and Local Mode

The MX61/61L is always in either the remote or local mode.
The MX61/61L is in the local mode immediately after it is turned ON. It is switched to the remote mode when the host transmits request command 1LOG ␣ IN to it. When the host transmits 1LOG ␣ OUT, the microscope is switched to the local mode.

Remote mode:
- In this mode, the host can control the MX61/61L to execute an operation or setting using an request command. In this mode, the MX61/61L can be controlled exclusively using the request commands.
- The status of the MX61/61L can be checked using the query commands.
- The four buttons on the microscope front panel (hereinafter referred to as the "front panel switches") and the buttons on the hand switch are extinguished in this mode.

Local mode:
- In this mode, the MX61/61L cannot be controlled using the request commands from the host. The microscope can be controlled exclusively using the front panel switches, hand switch and the external control of the revolving nosepiece.
- The status of the MX61/61L can be checked using the query commands.
- The front panel switches and hand switch buttons are illuminated in this mode.

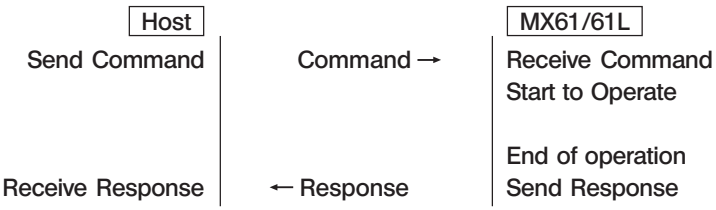
■ The following table shows the difference between the remote and local modes.

Mode	MX61/61L control	Request commands	Query commands	Front panel switches and U-HSTR2 buttons
Remote	Exclusively using the request commands.	Accepted	Accepted	OFF (extinguished)
Local	Front panel switches, hand switch, and external control of revolving nosepiece.	Not accepted except for 1LOG ␣ IN	Accepted.	ON (illuminated)

★When completing microscope control from the host using request commands, be always sure to switch the microscope mode from remote to local before disconnecting the RS-232C communication. If the microscope remains in the remote mode, the operations of the front panel switches and hand switch are extinguished and disabled.

Command Sequences

1) Successful communication



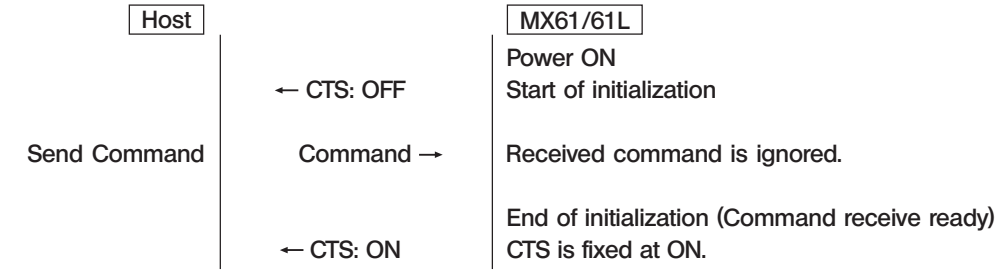
‹Explanation›

The response to a command is transmitted upon completion of the operation. If a command is sent before receiving the response to the previous command, the operation cannot be guaranteed.

2) In case the response for a command is not returned (Unsuccessful communication)

All of the commands sent from the host are ignored in the following cases.

Case 1: During initialization of the MX61/61L



‹Explanation›

The microscope cannot receive any command in the period after power ON until the completion of initialization.

When the MX61/61L is turned ON, CTS (Clear To Send, RS-232C pin 8) is set to OFF, and all commands received from the host while CTS is OFF are ignored. When initialization completes, CTS goes ON and the MX61/61L is ready for receiving commands from the host.

Once CTS is turned ON, it does not go OFF until the MX61/61L is turned OFF. The host can identify the completion of initialization (command receive ready status) by monitoring CTS.

Case 2: While the microscope is in local mode

‹Explanation›

When the MX61/61L is in local mode, it cannot receive any request command except for 1LOG␣IN.

◎The microscope can receive query commands even when it is in local mode.

Case 3: When the microscope receives a character string other than MX61/61L commands

‹Explanation›

When the string received by the MX61/61L is not a MX61/61L command (described later), the MX61/61L does not send a response for it.

5 Command List

The following table shows the commands used with the MX61/61L.
The commands and responses of the MX61/61L employ ASCII characters. Line feed code ‹CRxLF› is required after any command is added after any response. *1)

The detailed description on each command will be given on subsequent pages.

Command	Type *3)	Description	Response (when successful)
1LOG␣IN *2)	Request	Local → remote mode switching.	1LOG␣+
1LOG␣OUT	Request	Remote → local mode switching.	1LOG␣+
1LOG?	Query	Check of the current local/remote mode.	1LOG␣IN or 1LOG␣OUT
1OB␣n (n: 1 to 6)	Request	Rotation of the revolving nosepiece position to the number specified with “n” in the optical path.	1OB␣+
1OB?	Query	Check of the current revolving nosepiece position (objective) number.	1OB␣n (n: 1 to 6)
1EAS␣n (n: 0 to 3113)	Request	Setting of the aperture iris diaphragm to the position with the number specified with “n”. (n: 0 = Minimum. 1550 = Intermediate. 3113 = Maximum.)	1EAS␣+
1EAS?	Query	Check of the current aperture iris diaphragm position.	1EAS␣n (n: 0 to 3113)
1OBA␣n	Request	Rotation of the revolving nosepiece position (objective) with the number specified with “n” in the optical axis, plus setting of the aperture iris diaphragm to the position specified with the AS PRESET switch.	1OBA␣+
1CUBE?	Query	Check of the current observation method.	1OBA␣n (n: 1 = Brightfield or optional 2 = Darkfield)
1UNIT?	Query	Check of the presence of any unit connected to the MX61/61L.	1UNIT␣MX2, RVn or HS (n: 2 or 3)
1FPV␣ON	Request	Setting the anti-glare setting.	1FPV␣+
1FPV␣OFF	Request	Cancellation of the anti-glare setting.	1FPV␣+
1FPV?	Query	Check of the current darkfield glare prevention setting status.	1FPV␣ON or 1FPV␣OFF

*1) Line feed command ‹CRxLF› consists of ASCII codes 0x0D and 0x0A.
*2) “␣” represents a space.
*3) Command types
Request: Command sent by the host to the MX61/61L for requesting an operation or setting.
Query: Command sent by the host to the MX61/61L for inquiring its status.

6 Command Details

Log-in

1LOG 1LOG?

■**Functions**

1. Switches between remote and local modes of the MX61/61L.
2. Checks the current mode (local or remote) of the MX61/61L.

■**Special notes**

1. When the microscope is in local mode, it ignores commands except for "1LOG␣IN" and the query commands.
2. When the microscope is in local mode, it cannot receive the present commands during operation of the aperture iris diaphragm or revolving nosepiece.
3. When the microscope is set to remote mode by this request command, all of the front panel switches, the external control of revolving nosepiece (page 38), I/F signal input and the aperture iris diaphragm control input according to the DF/BF sensor are disabled except for the light intensity control and pilot lamp, and the microscope becomes exclusively controllable with these commands from the host. The illumination in the front panel switches and hand switch buttons are extinguished in remote mode.
4. When the microscope is set to local mode by this instruction command, all of the front panel switches and hand switch buttons are enabled and their illumination is lit up.

■**Command descriptions**

Command	Type	Description	Response	Result	Description
1LOG␣IN	Request	Local → remote mode switching.	1LOG␣+	Successful	The microscope is switched to remote mode.
			1LOG␣!,E01511	Error	It cannot be switched to remote mode because one of motorized units is operating.
			1LOG␣!,E01120	Error	A string other than "IN" and "OUT" was sent after "1LOG␣".
1LOG␣OUT	Request	Remote → local mode switching.	1LOG␣+	Error	It is switched to local mode.
			1LOG␣!,E01120	Error	A string other than "IN" and "OUT" is sent after "1LOG␣".
1LOG?	Query	Check of the current local/remote mode.	1LOG␣IN	Successful	The microscope is in remote mode.
			1LOG␣OUT	Successful	The microscope is in local mode.
			1LOG␣!,E01150	Error	A string is sent after "1LOG?␣".

*) "␣" represents a space.
Line feed command ‹CR›‹LF› is required after commands and line feed command ‹CR›‹LF› are added after any response.

Objective Switching

1OB 1OB?

■Functions

1. Rotates the objective in the specified revolving nosepiece position (objective) in the optical axis.
2. Checks the current revolving nosepiece position.

■Special notes

1. If request command 1OB␣6 is sent while a 5-position revolving nosepiece is used, an illegal parameter error will occur.
2. If the revolving nosepiece position is not in the optical axis or the sensor is abnormal, "X" is returned as the response in place of a number between "1" and "6".

■Command descriptions

Command	Type	Description	Response	Result	Description
1OB␣n (n: 1 to 5 when a 5-position nosepiece is used, or 1 to 6 when a 6-position nosepiece is used)	Request	Rotation of the revolving nosepiece position (objective) with the number specified with "n" in the optical axis.	1OB␣+	Successful	The specified revolving nosepiece position is engaged in the optical axis.
			1OB␣!,E11214	Error	It cannot be rotated in the optical axis due to a time-out error.
			1OB␣!,E01130	Error	The nosepiece is not connected or the connected nosepiece is not the designated model.
			1OB␣!,E01120	Error	A string other than "1" to "6" is sent as "n".
1OB?	Query	Check of the current revolving nosepiece position (objective) number.	1OB␣n (n: 1 to 5 or 6. X = Undefined.)	Successful	The nosepiece position that is currently engaged in the optical axis is returned.
			1OB␣!,E01150	Error	A string is sent after "1OB?␣".

*) "␣" represents a space.
Line feed command ‹CR›‹LF› is required after commands and line feed command ‹CR›‹LF› are added after any response.

Aperture Iris Switching

1EAS 1EAS?

■Functions

1. Sets the aperture iris diaphragm to the specified position.
2. Checks the current position of the aperture iris diaphragm.

■Special notes

1. The aperture iris diaphragm positions are referred to as; 0 = minimum; 1550 = intermediate; 3113 = maximum.
2. When a position out of the specified range (0 - 3113) is specified, an illegal parameter error is identified and no operation is executed.
3. The aperture iris diaphragm controlled with these commands is the reflected light aperture iris diaphragm.

■Command descriptions

Command	Type	Description	Response	Result	Description
1EASB␣n (n: 0 to 3113)	Request	Setting of the aperture iris diaphragm to the position with the number specified with "n".	1EAS␣+	Successful	The aperture iris diaphragm is set to the specified position.
			1EAS␣!,E01130	Error	The connection is disconnected due to an abnormality with the aperture iris diaphragm.
			1EAS␣!,E01120	Error	A string other than "?" is sent after "1EAS".
1EAS?	Query	Check of the current position of the aperture iris diaphragm.	1EAS␣n (n: 1 to 3113)	Successful	The current position of the aperture iris diaphragm is returned.
			1EAS␣!,E01150	Error	A string is sent after "1EAS?␣".

*) "␣" represents a space.
Line feed command ‹CR›‹LF› is required after commands and line feed command ‹CR›‹LF› are added after any response.

Objective/Aperture Iris Switching

1OBA

■Functions

1. Rotates the objective in the specified revolving nosepiece position in the optical axis and also sets the aperture iris diaphragm to the specified position.
2. When this command is sent during brightfield observation, the aperture iris diaphragm is set to the position specified with the AS PRESET switch.
3. When this command is sent during darkfield observation, the aperture iris diaphragm is set to the open position.
4. When this command is sent during darkfield observation for which the glare prevention is set, the aperture iris diaphragm, is closed, the revolving nosepiece is rotated and, after completing the rotation, the aperture iris diaphragm is opened.

■Special notes

1. When this command is sent during brightfield observation, the revolving nosepiece and aperture iris diaphragm are operated simultaneously, and the response is returned when both operations have completed.
2. If the request command for a 6-position is issued while a 5-position revolving nosepiece is used, an illegal parameter error will occur.
3. Even when multiple errors occur, the error code for only one error is returned.

■Command descriptions

Command	Type	Description	Response	Result	Description
1OBA␣n (1 to 6 when a 6-position nosepiece is used, or 1 to 5 when a 5-position nosepiece is used)	Request	Rotation of the revolving nosepiece position (objective) with the number specified with "n" in the optical axis, plus setting of the aperture iris diaphragm to the position specified with the AS PRESET switch.	1OBA␣+	Successful	The specified revolving nosepiece position is engaged in the optical axis.
			1OBA␣!,E11214	Error	It cannot be engaged in the optical axis due to a time-out error.
			1OBA␣!,E01130	Error	The nosepiece is not connected or the connected nosepiece is not the designated model.
			1OBA␣!,E11218	Error	An abnormality with the nosepiece.
			1OBA␣!,E11278	Error	The connection is disconnected due to an abnormality with the aperture iris diaphragm.
			1OBA␣!,E01120	Error	A number or string other than "1" to "6" is sent as "n".

*) "␣" represents a space.
Line feed command ‹CR›‹LF› is required after commands and line feed command ‹CR›‹LF› are added after any response.

Cube Status Check

1CUBE?

■Functions

1. Checks the current status of the cube (mirror unit) in the optical axis.

■Command descriptions

Command	Type	Description	Response	Result	Description
1CUBE?	Query	Check of the current status of the cube engaged in the optical axis.	1CUBE␣n	Successful	The cube that is engaged in the optical axis. n: 1 = BF (Optional cube) 2 = DF
			1CUBE␣!,E01150	Error	A string is sent after "1CUBE?␣".

*) "␣" represents a space.
Line feed command ‹CR›‹LF› is required after commands and line feed command ‹CR›‹LF› are added after any response.

Unit Presence

1UNIT?

■Functions

1. Checks if units are connected to the MX61/61L.

■Command descriptions

Command	Type	Description	Response	Result	Description
1UNIT?	Query	Check the connected units.	1UNIT␣P0,P1,P2	Successful	The P0, P1 and P2 units are connected. (See table below.)
			1UNIT␣!,E01150	Error	A string is sent after "1UNIT?␣".

■Response parameters

Parameter No.	String	Strings specifying the unit
P0	MX2	System ID. This is always present.
P1	RV2 RV3 None	U-D5BDREMC/U-P5REMC U-D6REMC Nosepiece not connected.
P2	HS None	U-HSTR2 is present. U-HSTR2 not connected.

*) "␣" represents a space.
Line feed command ‹CR›‹LF› is required after commands and line feed command ‹CR›‹LF› are added after any response.

Glare Prevention Setting (See page 20.) 1FPV 1FPV?

■Functions

1. Sets the glare prevention.
2. Cancels the glare prevention.

■Special notes

1. The glare prevention is set or canceled according to the setup of DIP switch No. 4 at the moment the microscope is turned ON. This command is used to change this initial condition.
2. The glare prevention setting of the MX61/61L made using instruction command 1FPV ␣ON is given priority over the DIP switch setting. The setting using 1FPV ␣ ON is enabled even after the microscope is switched the remote mode to local mode, until the microscope is turned OFF.

■Command descriptions

Command	Type	Description	Response	Description
1FPV␣ON	Request	Setting the anti-glare setting. (in darkfield observation only)	1FPV␣+	Setting is complete.
			1FPV␣!,E01120	A string other than ON/OFF is sent after "1FPV␣".
1FPV␣OFF	Request	Cancellation of the anti-glare setting.	1FPV␣+	Cancellation is complete.
			1FPV␣!,E01120	A string other than ON/OFF is sent after "1FPV␣".
1FPV?	Query	Check of the current glare prevention setting status.	1FPV␣ON	Glare prevention is ON.
			1FPV␣OFF	Glare prevention is OFF.
			1FPV␣!,E01150	A string is sent after "1FPV?␣".

*) "␣" represents a space.
Line feed command ‹CR›‹LF› is required after commands and line feed command ‹CR›‹LF› are added after any response.

7 Error Code List

The following table lists the error codes, their causes and remedies.
If the error recurs after applying the remedies described below, contact Olympus.

Error Code	Position	Phenomenon	Cause	Remedy
E01120	Command	Parameter error	The input string is erroneous.	Check the string used in the transmitted command.
E01130	Revolving nosepiece	Not connected error	Nosepiece connection failure.	Check the nosepiece connection.
			The nosepiece is not connected.	Connect the nosepiece.
			The connected nosepiece is not the designated model.	Connect the designated nosepiece.
	Aperture iris diaphragm	Not connected error	Cable wire disconnection.	Contact Olympus.
E01150	Command	Negative acknowledgement to a query command	A string was sent after a query command.	Re-check the command to be sent.
E01511	Command	System Busy	The 1LOG IN command was sent in the middle of operation of a motorized module.	The 1LOG IN command cannot be issued while a motorized module is being driven. Issue the 1LOG IN command after the drive of the motorized module has completed.
E11214	Revolving nosepiece	Time-out error	The operation was not completed in the specified period of time.	Revolving nosepiece: Check if there is an obstacle for movement.
E11218	Revolving nosepiece	Abnormality error	Irrecoverable error.	Contact Olympus.
E11271	Aperture iris diaphragm	Origin error	Aperture iris diaphragm initialization after power ON has not completed.	Switch on the power again.
E11272	Aperture iris diaphragm	Abnormality error	Irrecoverable error.	Contact Olympus.
E11278	Aperture iris diaphragm	Abnormality error	Irrecoverable error.	Contact Olympus.

5 EXTERNAL CONTROL OF REVOLVING NOSEPIECE

1 Connector Used

HR212-10R-8SDL (HIROSE ELECTRIC)

Applicable plug examples

Straight type: HR212-10P8PSAT
Right-angle type: HR212-10LA8PSAT

2 Pin Layout and Signal Names

All of the input/output signals are at the TTL level. The pin layout is shown on each connector.

Table 1 Signal Names

No.	Signal Name	I/O	Description
1	$\overline{\text{MOVE-R}}$	I	Nosepiece leftward switching request signal
2	GND	–	GND
3	$\overline{\text{MOVE-L}}$	I	Nosepiece rightward switching request signal
4	+5VD	–	+5 VD
5	$\overline{\text{MOVE}}$	O	"Rotating" (Out of light path) signal
6	$\overline{\text{STY0}}$	O	Nosepiece position No. signal 0
7	$\overline{\text{STY1}}$	O	Nosepiece position No. signal 1
8	$\overline{\text{STY2}}$	O	Nosepiece position No. signal 2

– : Negative logic.

3 Control Specifications

The revolving nosepiece starts rotation when MOVE-R or MOVE-L is set to "L". As the chattering processing is used for signal detection, the retention period of "L" should be at least 0.1 [s]. Since the "L" signal is not accepted during rotation, it is required to set the signal to "H" temporarily and then switch it again to "L" when successive drive is necessary. In this processing, the interval from the rise "L → H" till the fall "H → L" should be at least 1.2 [s].
Since the MOVE signal is "L" during operation, it is recommended to send the signal in synchronism with the MOVE signal when successive drive is necessary.

4 Revolving Nosepiece Position Numbers (Index Nos. on the Center of Revolving Nosepiece)

Table 2 shows the relationship between the revolving nosepiece position numbers and the STY signals.

Table 2 Revolving Nosepiece Position Numbers

Position No.	$\overline{\text{STY2}}$	$\overline{\text{STY1}}$	$\overline{\text{STY0}}$
1	1	1	0
2	1	0	1
3	1	0	0
4	0	1	1
5	0	1	0
During rotation	1	1	1

6 MAINTENANCE PART LISTS

Light source bulbs/burners

Bulb/Burner	Model	Average Life
Halogen bulb	• 12V100WHAL-L (Long life type) (PHILIPS 7724)	2000 hrs.
	• 12V100HAL (High-resolution type) (PHILIPS 7023)	50 hrs.
Mercury burner	• USH-103OL (USHIO)	300 hrs.
	• HBO103W/2 (OSRAM)	300 hrs.
Xenon burner	• UXL-75XB-A (USHIO)	200 hrs.
Halogen bulb for light guide light source	• JCR12V-100WB (USHIO)	1000 hrs.

Fuses

Applicable Fuses : ⊣▭⊢ T3.15A(H)250V
(LITTELFUSE 2153.15)

Immersion oil

Olympus immersion oil 8 cc/50 cc/500 cc

PROPER SELECTION OF THE POWER SUPPLY CORD

If no power supply cord is provided, please select the proper power supply cord for the equipment by referring to " Specifications " and " Certified Cord " below:

CAUTION: In case you use a non-approved power supply cord for Olympus products, Olympus can no longer warrant the electrical safety of the equipment.

Specifications

Voltage Rating	125V AC (for 100-120V AC area) or, 250V AC (for 220-240V AC area)
Current Rating	6A minimum
Temperature Rating	60°C minimum
Length	3.05 m maximum
Fittings Configuration	Grounding type attachment plug cap. Opposite terminates in molded-on IEC configuration appliance coupling.

Table 1 Certified Cord

A power supply cord should be certified by one of the agencies listed in Table 1 , or comprised of cordage marked with an agency marking per Table 1 or marked per Table 2. The fittings are to be marked with at least one of agencies listed in Table 1. In case you are unable to buy locally in your country the power supply cord which is approved by one of the agencies mentioned in Table 1, please use replacements approved by any other equivalent and authorized agencies in your country.

Country	Agency	Certification Mark	Country	Agency	Certification Mark
Argentina	IRAM		Italy	IMQ	
Australia	SAA		Japan	JET, JQA, TÜV, UL-APEX / MITI	
Austria	ÖVE		Netherlands	KEMA	
Belgium	CEBEC		Norway	NEMKO	
Canada	CSA		Spain	AEE	
Denmark	DEMKO		Sweden	SEMKO	
Finland	FEI		Switzerland	SEV	
France	UTE		United Kingdom	ASTA BSI	
Germany	VDE		U.S.A.	UL	
Ireland	NSAI				

Table 2 HAR Flexible Cord

APPROVAL ORGANIZATIONS AND CORDAGE HARMONIZATION MARKING METHODS

Approval Organization	Printed or Embossed Harmonization Marking (May be located on jacket or insulation of internal wiring)		Alternative Marking Utilizing Black-Red-Yellow Thread (Length of color section in mm)		
			Black	Red	Yellow
Comite Electrotechnique Belge (CEBEC)	CEBEC	‹HAR›	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V. Prüfstelle	‹VDE›	‹HAR›	30	10	10
Union Technique de l´Electricite´ (UTE)	USE	‹HAR›	30	10	30
Instituto Italiano del Marchio di Qualita´ (IMQ)	IEMMEQU	‹HAR›	10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC	‹HAR›	10	10	30
N.V. KEMA	KEMA-KEUR	‹HAR›	10	30	30
SEMKO AB Svenska Elektriska Materielkontrollanstalter	SEMKO	‹HAR›	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVE)	‹ÖVE›	‹HAR›	30	10	50
Danmarks Elektriske Materialkontroll (DEMKO)	‹DEMKO›	‹HAR›	30	10	30
National Standards Authority of Ireland (NSAI)	‹NSAI›	‹HAR›	30	30	50
Norges Elektriske Materiellkontroll (NEMKO)	NEMKO	‹HAR›	10	10	70
Asociacion Electrotecnica Y Electronica Espanola (AEE)	‹UNED›	‹HAR›	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT	‹HAR›	30	30	70
Instituto Portages da Qualidade (IPQ)	np	‹HAR›	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV	‹HAR›	10	30	90
Elektriska Inspektoratet	SETI	‹HAR›	10	30	90

Underwriters Laboratories Inc. (UL)	SV, SVT, SJ or SJT, 3 X 18AWG
Canadian Standards Association (CSA)	SV, SVT, SJ or SJT, 3 X 18AWG

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